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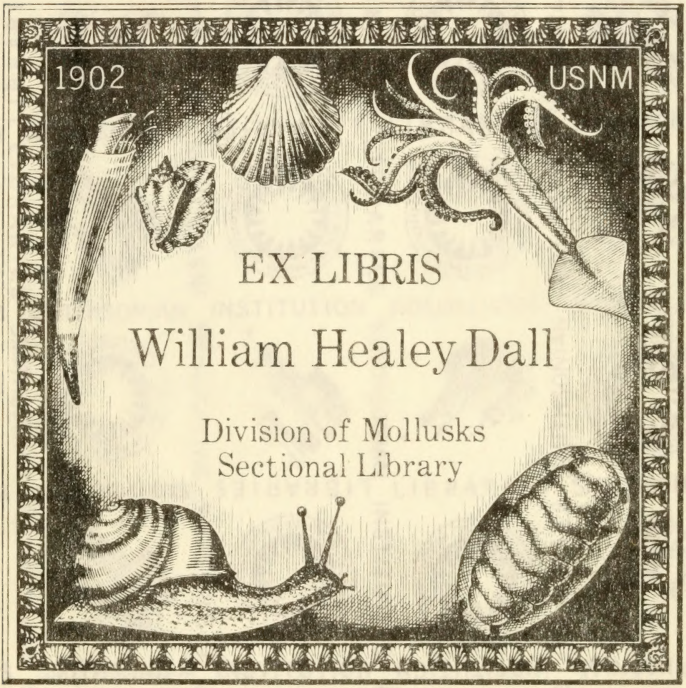

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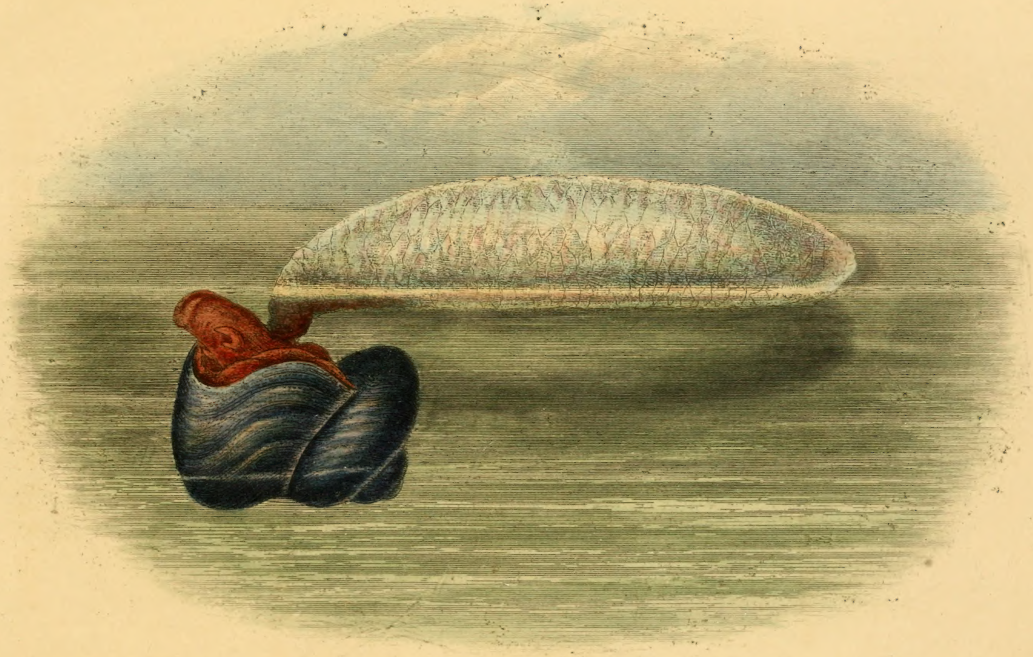

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BRITISH CONCHOLOGY,

OR AN ACCOUNT OF

THE MOLLUSCA

WHICH NOW INHABIT THE BRITISH ISLES AND THE SURROUNDING SEAS.

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VOLUME IV.

MARINE SHELLS,

IN CONTINUATION OF THE GASTROPODA AS FAR AS THE BULLA FAMILY.

BY JOHN GWYN JEFFREYS, F.R.S., F.G.S., &c.

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Genus III. RISSO'A*, Fréminville. Pl. I. f. 1.

Body rather slender: *mantle* furnished at the upper corner (and in some species also at the lower corner) of the mouth of the shell with a minute tentacular process: *head* depressed above and extended in front, where it forms a long and stout snout-like projection, which is divided at the extremity into two lobes, that serve as lips; it is armed with a pair of jaws and a very short spinous tongue: *tentacles* wholly or partially setose or hairy; tips blunt: *eyes* on small prominences or tubercles, one at the outer base of each tentacle: *gills* composed of from a dozen to twenty separate strands: *foot* lanceolate, narrow, double-edged, broader and more or less truncated in front, somewhat contracted in the middle, and pointed behind; sole grooved down the middle for about half its length towards the tail, whence it emits a glutinous thread by which the animal suspends itself to foreign bodies or to the surface of the water: *opercular lobe* large, divided into two wing-like expansions; beneath it at its hinder extremity issues a short tentacular appendage, which is in some species double or triple.

Shell oblong or oval, seldom umbilicate: *epidermis* very slight: *spire* usually elongated: *mouth* oval or trumpet-shaped, angulated above and slightly expanded below; its lips or margins are continuous.

The *Rissoæ* are minute, but elegantly shaped :—

> . . . . . "inest sua gratia parvis."

They are spread over all the globe—although the tropical seas have not been so well searched as those of the northern hemisphere for such small shells. Of the 25 species known in the British Isles, 15 inhabit the littoral and laminarian zones, and 10 the coralline and deep-sea zones. Woodward says that there are altogether 70 recent and 100 fossil species.

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* Dedicated to M. Risso, the well-known naturalist of Nice.

In a valuable paper by M. Mörch, "On the Homology of the Buccal Parts of the Mollusca" (Ann. and Mag. N. H., August 1865), the cheek-plates or immoveable mandibles of this and other genera are described as two lateral plates, without cutting-edges, composed of scaly or needle-shaped particles, which seem only of use to protect the inside of the mouth from being injured by the spinous tongue. The opercular appendage was first noticed by Bivona. It seems strange that Philippi could not detect it, and that notwithstanding he had figured seven species (including *Barleeia rubra*) he should have remarked, "Hæ species omnes simillimis animalibus incoluntur." The pallial filament protrudes at the will of the animal from the upper or anal corner of the aperture of the shell. *Hydrobia* and *Odostomia* have similar processes. In *Rissoa striatula* and *R. cancellata* there are two, one on each side. These, therefore, are certainly not organs of generation. The filament is found in every individual; and all the above-named genera are diœcious or unisexual. It may be an auxiliary tentacle. The spawn-cases are solitary and hemispherical.

The 'Transactions of the Imperial Academy of Sciences at Vienna' for 1863 contain an elaborate and admirably illustrated monograph by Gustav Schwartz v. Mohrenstern of part of this difficult group; I hope the remaining portion will soon be published. He has provisionally adopted the views of Messrs. H. and A. Adams to the extent of considering *Alvania* a distinct genus; but his reason for so doing seems to have originated in a misapprehension. According to the learned Austrian conchologist, *Alvania* is distinguished from *Rissoa* by having three caudal filaments instead of one. The authors of the 'Genera of recent Mollusca' say as

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to *Alvania*, "Operculigerous lobe winged on each side, usually with three caudal cirrhi." Now their type of this genus (*R. abyssicola*) has but a single caudal filament; and *Barleeia rubra* (which, under the name of *R. fulva*, is comprised in the same genus) has none at all. Of the 16 other species of *Alvania* enumerated by them, the animal of one only (*R. reticulata* or *Beanii*) appears to have been known to them. In their genus *Cingula*, however, we find *R. semistriata*, which notoriously has three caudal filaments, although the characters assigned to that genus are as follows:—"Opercular lobe and caudal cirrhus indistinct or rudimentary." This last-named genus comprises also *Barleeia rubra*, var. *unifasciata*. Under these circumstances it is well that Herr v. Mohrenstern has not absolutely decided on retaining the genus *Alvania*. I may here observe that the type of Risso's genus *Alvania* (from Leach's MS.) and 20 others out of the 23 which he described are cancellated shells, the remaining two being fossil species and erroneously referred to the *Turbo interruptus* and *T. parvus* of Montagu. The generic characters given by Risso will apply to almost every convoluted shell with an entire mouth and horny operculum; and at the most *Alvania* can only be a synonym of *Rissoa*. The other genera proposed by Messrs. Adams are in my opinion not more maintainable. *Onoba* is described as having the whorls not longitudinally ribbed, and the peristome not dilated. In the type (*R. striata*) both these characters exist to a certain extent. The only species assigned to *Ceratia* (viz. *R. proxima*) cannot be distinguished generically from *R. vitrea* (placed by Messrs. Adams in *Rissoa*) or from *R. striata*. Their genus *Setia* is characterized as having the tentacles pilose, and the operculigerous lobe destitute of a caudal filament;

R. pulcherrima is its solitary representative. In every species of *Rissoa* the tentacles are pilose; and *R. pulcherrima* has an unusually long and pointed caudal filament.

My examination of the *Rissoæ* has been on the same extensive scale as that of the *Pisidia.* The apology frequently offered for neglecting such tiny objects is unsatisfactory and unworthy of a naturalist—as if the Creator had bestowed more care in framing leviathan than in constructing the microscopic diatom, or as if the faculty which we enjoy of observing His varied works ought to be restricted to the contemplation of great things as being alone worthy of our exalted notions!

Fleming gave the name of *Cingula* to this genus, apparently being unacquainted with the scientific literature of the continent; and he proposed another genus (*Cyclostrema*) for *R. Zetlandica.* According to Philippi other species were separated by the Baron Bivona, under the generic title of *Loxostoma.* But such modest attempts at classification were far excelled by Leach, who repudiated *Rissoa,* and divided it into no less than eight genera, some of which contained the very same species as those described in others of these so-called genera.

The species being numerous, it may be convenient to divide them on a conchological basis:—

A. Cancellated; outer lip usually strengthened by a rib, and sometimes notched within. 1. *striatula*; 2. *lactea*; 3. *cancellata*; 4. *calathus*; 5. *reticulata*; 6. *cimicoïdes*; 7. *Jeffreysi*; 8. *punctura*; 9. *abyssicola.*

B. Ribbed lengthwise and spirally striated; outer lip thickened and reflected. 10. *Zetlandica*; 11. *costata.*

C. Mostly ribbed lengthwise, and spirally striated; outer lip usually strengthened by a rib. 12. *parva*; 13. *inconspicua*; 14. *albella*; 15. *membranacea*; 16. *violacea*; 17. *costulata*; 18. *striata.*

D. Spirally striated, or smooth; outer lip plain. 19. *proxima*;

20. *vitrea*; 21. *pulcherrima*; 22. *fulgida*; 23. *soluta*; 24. *semistriata*; 25. *cingillus*.

It will be seen, however, by the following description of the species, that some of them cannot be placed strictly in one group more than in another.

A. Cancellated; outer lip usually strengthened by a rib, and sometimes notched within.

1. Rissoa stria'tula*, Montagu.

Turbo striatulus, Mont. Test. Br. p. 306, t. 10. f. 5. *R. striatula*, F. & H. iii. p. 73, pl. lxxix. f. 7, 8.

Body yellowish-white, with a blood-red mark over the head: *mantle* forming a small oval lappet or lobe on each side of the neck as in *Trochus*; its outer edge is furnished with two thread-like and finely ciliated processes, one at each of the corners of the mouth of the shell, and which project or hang down, seemingly at the will of the animal: *snout* longish, narrow, cloven at the extremity: *tentacles* thread-shaped, somewhat flattened on the upper and lower surfaces, with blunt tips; they are clothed with a very few short cilia: *eyes* on small tubercles: *foot* squarish in front, and pointed behind; when extended it is apparently divided (as in many other, perhaps every, species of *Rissoa*) into two parts, anterior and posterior: *opercular* or caudal *appendage* single, rather long, but not projecting beyond the tail or point of the foot; it issues from beneath the operculigerous lobe: *excrement* oval, dark-green.

Shell conic-oval, with a turreted outline and a slightly twisted base, solid, opaque, somewhat glossy when the surface is not obscured by a mineral coating: *sculpture*, several laminar transverse ridges, 10 or 11 of which are on the body-whorl, and 3 only on each of the next three whorls; those encircling the body-whorl are very unequal in size, the 3 uppermost being by far the largest and most apart one from another; the 3 basal ridges are also widely separated, the intermediate ones being close together; the uppermost ridge is placed at some distance from the suture; the interstices of all the ridges are crossed by numerous incurved striæ, so as to give the appearance of very fine lattice-work; these are stronger and more conspicuous on the upper than under part of the shell; labial rib thick, sometimes double, or else having a varix on the body-whorl; top whorls quite smooth and polished: *colour* that of alabaster, with a scarcely perceptible tinge of yellow and occasionally an ochreous stain: *spire* moderately produced and pointed: *whorls* 5–6, convex, the last composing rather more than two-thirds of the shell: *suture* distinct, but not deep or channelled; the separation of the whorls is chiefly indicated by the prominent spiral ridge which surmounts each: *mouth* large, occupying about half the length of the spire, roundish-oval, angulated somewhat acutely above and obtusely below, and slightly expanded outwards: inside plain: *outer lip* semicircular, forming a very narrow rim within the labial rib: *inner lip* broad and thick, reflected on the pillar, and united with the outer lip at the upper corner of the mouth: *operculum* pale horncolour, with a short lateral spire, and very delicately striated. L. 0·215. B. 0·15.

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* Slightly striated.

HABITAT: Lower part of the littoral zone in the Channel Isles, and on the coasts of Dorset, Devon, and Cornwall; by no means common. It has also been found at Margate (Hanley), Tenby (Lyons), Arran Isles, co. Galway (Barlee), Miltown Malbay, co. Clare (Harvey, *fide* Thompson), Bantry Bay (J. G. J.), Dublin Bay (Waller), off Larne, co. Antrim (Hyndman and J. G. J.), Cumbrae, Arran, N.B. (J. Smith), Lamlash Bay (Norman). Fossil in a bone-cavern at Mardolce in Sicily (Philippi). North and west of France (De Gerville, Cailliaud, and others); Cadiz (M'Andrew); south of France (Michaud and others); Dalmatia (Brusina); Spezzia (J. G. J.); Naples (Scacchi, *fide* Philippi).

This, as well as *R. cancellata*, adheres with some tenacity to the stones on which it is found; and when detached it also spins a fine byssal thread, by means of which it suspends itself in the water. The carving of the shell is inimitable. One of my specimens (probably a male), although full-grown, is little more than three-quarters of a line in length, and of proportionate breadth.

The *Turbo striatulus* of Linné appears to have been *Parthenia varicosa* of Forbes = *Chemnitzia pallida*, Philippi. Da Costa described and figured the present species as *T. carinatus*; and I would have adopted that original and expressive name, were it not for the consideration that, no subsequent author having done so, I have no wish to be singular, or to make any unnecessary change in the nomenclature. Turton called this shell *T. monilis*, Michaud *R. cochlea*, Philippi *R. labiata*, and Leach *Persephona brevis*.

2. R. LAC'TEA *, Michaud.

R. lactea, Mich. Descr. esp. Riss. p. 9, f. 11, 12; F. & H. iii. p. 76, pl. lxxix. f. 3, 4.

SHELL oval, compressed towards the mouth, rather thin, semitransparent and somewhat glossy when living, opaque and lustreless when dead: *sculpture*, slight and gently curved longitudinal ribs, which are seldom continued below the periphery and are crowded near the outer lip; there are about 20 on the last and 10 on the penultimate whorl; these ribs are crossed by fine spiral striæ, 15 of which are on the last and 9 on the penultimate whorl; the ribs are more prominent than the striæ, the points of intersection never being nodulous; there is sometimes, but rarely, a slight labial rib; the first two whorls are perfectly smooth: *colour* whitish, with a faint tinge of yellow, in dead shells milk-white: *spire* abruptly pointed: *whorls* 5–6, moderately convex, compressed towards the front; the last composes nearly three-fourths of the shell, and the first two are minute: *suture* slight but distinct: *mouth* oval, produced and angulated above, spread out below, not expanded outwards; inside plain: *outer lip* rather thick: *inner lip* broad, reflected over the pillar, and united with the outer lip at the upper corner of the mouth, where there is a considerable thickening: *operculum* pale horncolour, with a short spire, and not conspicuously striated. L. 0·233. B. 0·15.

HABITAT: Under stones at extreme low water of spring tides, and thrown upon the beach: St. Aubin's

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* Milk-white.

Bay, Jersey (Hanley, Norman, and Dodd); Herm (Macculloch, Lukis, and Barlee); Barricane, north Devon (Miss Jeffreys, who never was in the Channel Isles or abroad). It is our rarest *Rissoa*. Sicilian tertiaries (Philippi). The only northern locality to my knowledge is Bohuslän in the south of Sweden, where Malm dredged two specimens (both dead) in different places. By his kind permission one of them, from 12 f., is now before me. Its southern range is extensive, and embraces the north and west of France (Collard des Cherres, Cailliaud, Aucapitaine, and others), Vigo, 4 f., Gijon and Faro in Algarve, and Corunna (M'Andrew), Adriatic (Heller), Dalmatia (Brusina), northern shores of the Mediterranean (Michaud, J. G. J., and others), Ajaccio (Requien), Naples (Scacchi), near Catania (Philippi), Algeria (M'Andrew and Weinkauff).

Turbo cancellatus (Beudant) of Lamarck.

3. R. CANCELLA'TA*, Da Costa.

Turbo cancellatus, Da Costa, Br. Conch. p. 104, pl. viii. f. 6, 9. *R. crenulata*, F. & H. iii. p. 80, pl. lxxix. f. 1, 2.

Body milk-white, with a pinkish spot above the head: *pallial lappet* small, as in *R. striatula*: *pallial filaments* slender and microscopically ciliated, resembling minute auxiliary tentacles, one at each corner of the mouth of the shell: *snout* narrow and cloven at the point, extensile: *tentacles* cylindrical, but somewhat compressed on the upper and under sides, finely and closely ciliated all over; they are occasionally borne erect, or now and then upturned: *eyes* on small tubercles: *foot* squarish in front, with small angular corners, contracted in the middle, and attenuated towards the tail, which is bluntly pointed: *appendage* short, not projecting beyond the tail, apparently bicuspid, but really consisting of three filaments, one of which is smaller than the other two and is sometimes a mere bulb.

Shell conic-oval, solid, opaque, somewhat glossy: *sculpture*, strong longitudinal ribs, 16 of which are on the body-whorl,

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* Latticed.

15 on the penultimate, 14 on the succeeding whorl, and 13 on the next, not more than half the last number being discernible on the upper whorl, when they altogether disappear; these ribs are continued to the base, which is furnished with an angular projection or knob, owing to this part of the pillar being greatly thickened; there are also equally strong spiral ribs, 6 of which are on the body-whorl, 3 or 4 on the penultimate, and 2 only on each of the succeeding three whorls; the first two or three whorls are apparently quite smooth and glossy, but under the microscope exhibit extremely fine and numerous longitudinal wavy striæ; the two sets of ribs cross each other, leaving between them square cavities and forming at the points of intersection raised and rather sharp tubercles, imparting to the surface a prickly aspect; labial rib broad, and traversed by the spiral ribs up to the mouth, the edge of which consequently becomes scalloped or indented: *colour* yellowish-white, with often more or less of a rufous tinge, or indistinctly marked by two reddish-brown bands, a narrow one below the suture and a broad one round the periphery; sometimes the colour is milk-white; the throat or inside of the mouth is frequently stained by reddish-brown: *spire* short and acute: *whorls* 6–7, convex, the last occupying two-thirds of the total length; the first two or three whorls are disproportionately small: *suture* broadly excavated: *mouth* roundish oval, expanding outwards, finely and closely ridged lengthwise on the inside of the labial rib; there are 12 of these ridges, besides usually a blunt tubercle on the lower part of the pillar: *outer lip* thin: *inner lip* forming a rather broad glaze on the pillar, which is imperforate: *operculum* not very thin, having a somewhat lateral spire (as in *Littorina*), and conspicuously and closely striated in a curved direction corresponding with the line of growth. L. 0·185. B. 0·115.

Var. *paupercula*. Dwarfed, more regularly oval and solid, with a proportionally longer spire. L. 0·135. B. 0·065.

Habitat: Rocks and stones at low water of spring tides, and the coralline zone, in the Channel Isles and on many parts of the Cornish coast; rather common, especially at Herm. Received from Sandwich (Montagu); west bay of Portland, 15 f. (M'Andrew and Forbes); Torquay (Hanley); Salcombe Bay (Barlee);

off Lundy Island (M'Andrew); Manorbeer, Pembrokeshire (J. G. J.); Isle of Man, "one broken specimen from deep water on the north coast" (Forbes); Nymph bank, 50 f. (M'Andrew); Bantry (Miss Hutchins, Thompson, and Barlee); Dublin Bay (Turton and Brown); Belfast Bay (Hyndman); off Larne, co. Antrim, 18–20 f. (J. G. J.); Lough Strangford, 7–20 f. (Dickie); Tyningham sands, N.B. (Brown); Lamlash (Landsborough); Loch Fyne, and the Hebrides as far north as Stornoway (Barlee and J. G. J.). A single dead and worn specimen of the variety was found by me at Herm; it may belong to a distinct species or be exotic. *R. cancellata* is fossil in the Sussex beds (Godwin-Austen); Ireland (J. Smith); Calabria (Philippi). Its living range is mostly southern, from Cherbourg (Récluz and Macé) and Morbihan (Taslé) to the Gulf of Gascony (D'Orbigny père, and J. G. J.), and Corunna (M'Andrew and H. Woodward), throughout the Mediterranean (Michaud and others); Adriatic (Heller); Dalmatia (Brusina); Mogador, 3 f. (M'Andrew); Ægean (Forbes, *fide* M'Andrew); Madeira, 15–24 f., and Canary Isles, 12–60 f. (M'Andrew). The last-named naturalist also took some dead specimens in his Norwegian dredgings.

It is active and bold, floats like its congeners, and spins a byssal thread instantaneously on being detached from a crawling position. The incessant play of the cilia that fringe the tentacles is very striking; it appears to be caused by the action of a double row of muscles in each tentacle, arranged in the form of a siphon, which is perceptible through the transparency of the integument. The pallial filaments probably serve the purpose of supplementary tentacles to warn the animal of impending danger. In spite of its stoutness the shell is sometimes perforated, possibly by *Murex erinaceus* or *M. corallinus*.

This is the *Turbo cimex* of Donovan, Montagu, and other conchologists (but not of Linné), *R. crenulata* of Michaud, and *Persephona Hutchinsiana* of Leach. The *R. lactea* of Michaud having been previously described by Lamarck as *Turbo cancellatus* (but subsequently to Da Costa's publication), we must either call that species *cancellata* and give up the name *lactea*, retaining *crenulata* for the present species, or else adhere to the strict rule of priority. Convenience, as well as justice, makes the latter alternative more desirable. *R. cancellata* of Desmarets is the Linnean *R. cimex*, which (as *Turbo calathiscus* of Montagu) Mr. Thompson of Belfast seems to have mistaken for the species now described.

4. R. CA'LATHUS*, Forbes and Hanley.

R. calathus, F. & H. iii. p. 82, pl. lxxviii. f. 3.

SHELL more conical and coarsely sculptured than the next species (*R. reticulata*); longitudinal striæ more prominent; penultimate whorl not quite so broad in proportion to the body-whorl, and having usually but 4 rows of spiral striæ—although this last character is not constant, there being sometimes 5 and even 6 rows. Colour, size, and other particulars the same as in *R. reticulata*.

HABITAT: Guernsey and Herm; rather common. Land's End (Hockin); Whitesand Bay (Mrs. Flack); off Penzance, 15–20 f. (M'Andrew and Forbes); Shell-ness, Kent (J. G. J.); off the Mizen Head, 50 f. (M'Andrew); Kilkee, co. Clare (Warren, *fide* Thompson); Isle of Man (Packe); co. Antrim (Hyndman and J. G. J.); Clyde district (Smith and Landsborough); Loch Carron (J. G. J.); Hebrides (Barlee). Coralline Crag at Sutton (S. Wood, as *R. abyssicola*). Drontheim, 5–40 f., and Vigo (M'Andrew); Morbihan (Taslé); Gulf of

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* A wicker basket.

Lyons (Martin); Nice (Vérany); Spezzia (J. G. J.); Canaries (M'Andrew in mus. Brit.).

This is a very doubtful species; and conchologists must exercise their own discretion as to admitting it. My impression is that it constitutes only a variety of *R. reticulata*. The authors of the 'British Mollusca' say that the two "may usually be distinguished with readiness by the smaller size of their latticework. Every degree of reticulation, from coarse to fine, may be seen by comparing a sufficient number of specimens.

5. R. RETICULA'TA *, Montagu.

Turbo reticulatus, Mont. Test. Br. p. 322, t. 21. f. 1. *R. Beanii*, F. & H. iii. p. 84, pl. lxxix. f. 5, 6.

BODY yellowish-white: *mantle* furnished with a single filamental process: *snout* "near its termination at the upper surface appears to have attached to it two very small similar shields, one on each side, independent of the terminal minute subcircular flat lobes:" *tentacles* compressed, slender, rather long, "not setose" [?]: *eyes* on short light-yellow or orange pedicles: *foot* "subrotund, scarcely auricled, but grooved in front sufficiently to form a shallow labium, slightly constricted anteriorly at one-third the length, gently tapering to a rather obtuse lanceolate but not emarginate termination:" *opercular lobe* plain, moderately expanded: *appendage* consisting of three blunt, cylindrical, short cirri: *gill* composed of 12–15 single, pale-yellow, short strands, which are visible when the neck is much protruded. (Clark.)

SHELL oblong, solid, nearly opaque, more or less glossy: *sculpture*, numerous somewhat obscure and slightly curved longitudinal ribs, seldom extending to the base, and crossed by equally numerous but much more distinct and thread-like spiral ribs, which cover the surface of the last 4 whorls; the points of intersection are sometimes nodulous, but rarely on the lower part of the body-whorl; there are 6 or 7 rows of spiral striæ on the penultimate whorl; labial rib thick and traversed by the spiral striæ, occasionally forming a separate varix; top whorls smooth and glossy, showing under the microscope faint traces of punctures: *colour* pale yellowish-brown, with now and then two bands of a tawny hue, one immediately under the suture and the other below the periphery; pillar-lip often stained with reddish-brown: *spire* acute: *whorls* 6–7, rather convex, and gradually enlarging, the last occupying about three-fifths of the spire; the penultimate is nearly as broad as the last whorl: *suture* slight, narrowly excavated: *mouth* roundish-oval, somewhat expanded outwards, finely and closely furrowed on the inside of the labial rib; the furrows correspond with the spiral striæ: *outer lip* thin and very narrow, as in all the other species of this section: *inner lip* slight and reflected on the pillar, behind which there is a narrow groove, but never a decided umbilical chink: *operculum* filmy, with a short spire, and finely striated in the line of growth. L. 0·15. B. 0·075.

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* Reticulated.

HABITAT: Nearly every part of our coasts, from the Land's End to Lerwick, in 7–50 f.; not uncommon. Fossil in the south of Italy and in Sicily (Philippi—assuming this to be his *R. textilis*). *R. reticulata* of S. Wood, from the Coralline Crag, more resembles *R. calathus*, and may be an intermediate variety. Lovén, Sars, M'Andrew, Danielssen, and Malm have recorded the present species as Scandinavian, from Molde in Finmark to Bohuslän in the south of Sweden, the two last-named authors giving respectively 40–60 and 20–30 f. North coast of Holland, 17 f. (Malm); Vigo (M'Andrew); Gulf of Lyons (Martin); Dalmatia (Brusina, as *Alvania Beani*); Cannes (Macé); Spezzia (the Marquis Doria and J. G. J.); Algeria (Weinkauff); and Ægean 30–185 f. (Forbes).

The sculpture of some specimens is rather stronger than that of others. Mediterranean specimens are frequently marked by highly coloured bands. This shell is more oblong than *R. cimicoïdes*, and not so conical (partly in consequence of the penultimate whorl being prominent in *R. reticulata*), and the cancellation is finer and closer. "The animal is active, and freely shows its points" (Clark).

It is the *R. Beanii* of Hanley. *R. textilis* of Philippi is probably the immature state. Adams's *Turbo reticulatus* ("T. quatuor anfractibus reticulatis, apertura subrotunda. Obs. color albus.") appears to have been the young of *R. striata*; but that of Montagu is unquestionably the one now under consideration. *R. reticulata* of Philippi, a Sicilian fossil, is very different. Turton, in his 'Conchological Dictionary,' interchanged the characters of the present species and *R. punctura*, and reversed the admeasurements.

6. R. CIMICOÏ'DES *, Forbes.

R. cimicoides, Forb. in Rep. Br. Assoc. for 1843, p. 189. *R. sculpta*, F. & H. iii. p. 88, pl. lxxx. f. 5, 6.

BODY milk-white and almost transparent: *snout* short, bifid, of a brownish hue: *tentacles* slender, with blunt tips: *eyes* small: *foot* broad, squarish in front, and pointed behind.

SHELL conic-oval, solid, opaque, somewhat glossy: *sculpture*, several stout and slightly curved longitudinal ribs, not extending to the base, and crossed by more regular and thread-like spiral striæ or riblets, which cover the surface of the last four whorls; small tubercles or nodules are formed at the points of intersection; there are 4 rows of spiral striæ on the penultimate whorl; labial rib thick (sometimes double), traversed by the spiral striæ, and marked with minute and numerous lines of growth; top whorls encircled with close-set and punctured striæ: *colour* pale yellowish-white, more or less deeply tinged with reddish-brown, and having usually an imperfect streak of the latter colour close to the labial rib on the outside, which terminates at the periphery in a broad mark, covering three of the spiral striæ; these markings appear to result from two obscure bands, one below the suture and the other round the base; apex light orange: *spire* sharp-pointed: *whorls* 6–7, sloping upwards, compressed, somewhat gradually enlarging, the last occupying about three-fifths of the spire: *suture* slight, but distinctly channelled: *mouth* more round than oval, expanding a little outwards, finely notched or furrowed on the inside of the labial rib; these notches or furrows are not caused by the impress of the spiral striæ, although they correspond in number and position: *outer lip* thin: *inner lip* slight, reflected on the pillar; there is no umbilical chink: *operculum* filmy, with a short spire. L. 0·15. B. 0·085.

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* Resembling *R. cimex.*

Var. *minima*. Dwarf; spire very short.

Habitat: Coralline zone, Guernsey (J. G. J.); Helford (Hockin); Exmouth (coll. Clark); Coquet and Berwick Bay (Mennell); Cork Harbour (Wright); west coast of Ireland (Hoskyns); Larne, co. Antrim (J.G.J.); Skye and Hebrides (M'Andrew and others); Aberdeenshire coast (Dawson); Shetland (Barlee and J. G. J.). The variety was found at Plymouth by Mr. Barlee. *R. cimicoïdes* inhabits the Ægean, 2–69 f. (Forbes); Dalmatia (Brusina); Gulf of Lyons (Martin); Bohuslän, 50–80 f. (Martin); Bergen (Lilljeborg); upper Norway (M'Andrew); and Greenland (coll. M'Andrew).

I have no doubt that this is the *R. cimicoïdes* of Forbes, having compared specimens so named by him in the British Museum and Mr. M'Andrew's collection with the original description of that species, as well as with the Scotch specimens from which the description and figures of *R. sculpta* in the 'British Mollusca' were taken. The *R. sculpta* of Philippi appears to have a more regularly oval shape, the larger whorls are cross-barred ("clathrati"), and the inside of the mouth is smooth. This agrees with *R. calathus* of Forbes and Hanley, except in the latter having the throat crenated. Lovén regarded *R. abyssicola* as Philippi's shell. *Pasithea nigra* of Totten, from Rhode Island, is allied to the present species.

7. R. Jeffrey'si *, Waller.

R. Jeffreysi, Wall. in Ann. & Mag. N. H. s. 3. xiv. p. 136.

Shell conic-oval, with a somewhat turreted outline, moderately solid, semitransparent and rather glossy: *sculpture*, numerous fine longitudinal striæ, which are crossed by stronger, fewer, and rib-like transverse striæ, forming by their intersection an open network; the longitudinal striæ are gently curved, and they do not reach the base, although there are sometimes traces of them below the periphery; the labial rib is strong but not thick, and traversed by the spiral striæ only; of these striæ 3 or 4 are more conspicuous than the rest on the body-whorl; examined microscopically the whole surface is covered with extremely close-set spiral lines; and even by the aid of a Coddington the top whorls may be seen to have a few spiral rows of salient and reentering angles, which last prefigure the cancellated structure of the adult shell: *colour* clear-white: *spire* ending in a blunt and almost truncated point: *whorls* 5, convex, gradually enlarging, the last exceeding all the others put together in the ratio of nearly 5 to 3 when viewed with the mouth upwards, but when placed with the mouth downwards these proportions are reversed; the apex is compressed: *suture* very deep and channelled: *mouth* more round than oval, scarcely expanding outwards: *outer lip* thin, incurved above: *inner lip* slightly reflected, and having behind it a more or less distinct umbilical chink. L. 0·1. B. 0·065.

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* So named out of compliment to the author of the present work.

HABITAT: Sandy ground off Unst (the most northern of the British Isles), at distances of about 8 and 30 miles from the land, in 70–85 f.; rare. Norway (Lilljeborg and Malm; the locality mentioned to me by the latter is Eggersbank, and the depth 150 f.); North America (M'Andrew, by whom it was received from a correspondent).

The dried remains of the animal exhibit an orange tint in the region of the liver. Although of the same size as *R. punctura*, this is of a somewhat turreted shape, clear-white, and nearly transparent, the reticulation is much less crowded (resembling open lacework), the spiral striæ in the middle are more prominent, the suture deeper, whorls more gradually increasing, and the apex is blunt and marked with a Vandyke pattern instead of having rows of punctures. The present case exemplifies what I said in the Introduction to this work (vol. i. p. xlvii), viz. that the nucleus of the shell often furnishes the conchologist with an important character for discriminating species. This part, in fact, represents the earliest stage of growth, before external conditions have had any power in influencing or modifying the structure.

8. R. PUNCTU'RA*, Montagu.

Turbo punctura, Mont. Test. Br. p. 320, t. 12. f. 5. *R. punctura*, F. & H. iii. p. 89, pl. lxxx. f. 8, 9.

Body yellowish, streaked with purple (marked with a small red dot under the neck near the eyes, Clark): *mantle* furnished at each upper corner of the aperture of the shell with a short cylindrical process: *tentacles* thread-shaped, rather short, indistinctly ringed, scalloped at the edges, and sparsely but finely setose: *eyes* slightly raised: *foot* squarish in front, and bluntly pointed behind: (*opercular lobe* very pale muddy-reddish-brown, and having on each side, close to the junction of the foot with the rest of the body, an irregular, rather large, dusky or lead-coloured stripe, Clark): *appendage* simple and short.

Shell conic-oval (in some specimens more oblong), rather solid, nearly opaque, and somewhat glossy: *sculpture*, numerous fine longitudinal and spiral ribs or striæ, which by their decussation form minute squares, and are muricated at the points of intersection; the longitudinal ones are slightly curved and do not reach to the base; the labial rib is more or less thick, according to age, and it occasionally leaves one or two varicose excrescences on the body-whorl; sometimes it is placed close to the mouth, and at other times at a short distance from it; the spiral ribs or striæ are thread-like and usually are more conspicuous than the others; the uppermost whorls exhibit under the microscope a few rows of punctures: *colour* dirty white, often tinged with yellow or reddish-brown, and now and then having the last whorl partially spotted or double-banded with the latter hue; there is frequently also a blotch of reddish-brown outside the mouth, and a similar stain on the pillar-lip: *spire* pointed, usually rather elongated, rarely very short: *whorls* 6, convex, the last occupying about three-fifths of the spire, the first minute and somewhat prominent: *suture* deep: *mouth* roundish-oval, scarcely expanding outwards: *outer lip* thin, not much incurved above: *inner lip* reflected on the pillar and at the base, behind which is a slight depression or chink: *operculum* filmy, with a short spire, and delicately striated. L. 0·1. B. 0·065.

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* From its punctured surface; literally, a pricking.

Var. *diversa*. Longitudinal ribs finer and more prominent,—a character which gives this variety a different aspect.

HABITAT: Widely distributed, in the lower part of the laminarian zone and throughout the coralline zone, from Guernsey to Unst, at a depth of from 1–95 f. The variety is from Skye and Shetland. *R. punctura* occurs in upper tertiary deposits in Sussex (Godwin-Austen), Ayrshire (Landsborough, *fide* Thompson), and at Uddevalla (Malm), and in the post-glacial beds of Norway at various heights from the present level of the sea to 100 feet above it (Sars). Wood includes it (although with a doubt as to the identity of the species) in his 'Crag Mollusca,' from the Coralline formation at Sutton; but his description shows that the outer lip is notched within, a character which the recent shell does not possess. It inhabits Bohuslän, according to Lovén, who called it *R. textilis* of Philippi; Malm dredged it in the same district in 10–60 f., Danielssen at Christiansund in 40–60 f., M'Andrew in Nordland, and Sars at Tromsö, Öxfjord, and elsewhere in Norway in 10–50 f.; Taslé found it in Brittany; Martin has taken it in the Gulf of Lyons, Macé at Antibes, Vérany at Nice, Brusina in Dalmatia, and M'Andrew off Orotava, Canary Isles.

Of this species, again, we have two sizes, a large and small one.

It appears to be the *Turbo retiformis* of Montagu (from Walker's doubtful description and figure), *R. puncturata* of Macgillivray, *R. approxima* of Brown, and *Turritella Dorvilleana* of Leach.

9. R. ABYSSI'COLA*, Forbes.

R. abyssicola, F. & H. iii. p. 86, pl. lxxviii. f. 1. 2, and (animal) pl. JJ. f. 3.

BODY whitish, with a faint tinge of yellow or saffron on the front, and microscopically speckled with flake-white: *mantle* rather thick-edged; pallial processes one on each side, short and not protruded beyond the mouth of the shell; *snout* small and narrow, deeply cloven, carried somewhat in advance of the foot: *tentacles* thread-shaped, flattened, clothed with minute and short but not numerous cilia: *eyes* large and black, on bulbs at the lower base of the tentacles: *foot* squarish in front, with short angular corners, narrowing behind to a rounded and slightly bilobed tail: *appendage* single, placed far behind the tail, and issuing from the opercular lobe.

SHELL oval, with a slight tendency to oblong and a somewhat oblique outline, rather solid, semitransparent and glossy: *sculpture*, numerous slight longitudinal ribs on the last three or four whorls, but not extending to the base; they are flexuous on the body-whorl and curved on the others; the labial rib is strong, and placed close to the mouth; the whole surface is covered with close-set and fine, apparently (but not really) undulating spiral striæ, which are as prominent although not so large as the ribs, and by their intersection give a somewhat muricated appearance; these striæ cross the labial rib, as in the preceding species, and reach to the outer lip; the interstices of the striæ on the base show, under a high magnifying power, indistinct traces of longitudinal ribs; the uppermost whorls are microscopically reticulated: *colour* clear-white, with occasionally a blotch of reddish-brown behind the labial rib: *spire* short and abrupt: *whorls* 5, somewhat compressed but rounded, the last occupying about two-thirds of the spire, and the first minute and flattened: *suture* deepish, and sometimes slightly channelled: *mouth* roundish-oval, obliquely expanding outwards: *outer lip* narrow, thin, and sinuous, incurved above: *inner lip* reflected on the pillar and at the base, united with the outer lip, but not forming a distinct peristome: *operculum* filmy, few-whorled, with a small excentric spire, and finely striated in the line of growth; through it may be seen the opercular lobe, of a yellow colour. L. 0·085. B. 0·05.

HABITAT: Mud in 50–70 f., Loch Fyne (where M'Andrew and Forbes discovered it), Skye and Hebrides (Barlee and J. G. J.), Shetland (Forbes and Barlee); and Mr. M'Andrew has dredged it also 15 miles south-west of Mizen Head, co. Cork. Norway (M'Andrew); Bohuslän (Lovén, as *R. sculpta* of Philippi); off Vigo Bay and Malaga (M'Andrew); Gulf of Lyons (Martin, as *R. scabra* of Philippi); 40 miles off Malta in 350 f. (Spratt). It is a local and somewhat rare species.

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* Inhabiting deep water.

It floats like its congeners, and suspends itself in the water by a single byssal thread. Mediterranean specimens are smaller than ours, and have rather stronger sculpture. Two different sizes occur, as is also probably the case with every other species of *Rissoa*. One of my specimens shows in the middle of the last whorl a distinct varix, caused apparently by a new growth having taken place after the shell had arrived at maturity.

B. Ribbed lengthwise, and spirally striated; outer lip thickened and reflected.

10. R. ZETLAN'DICA*, Montagu.

Turbo Zetlandicus, Mont. in Tr. Linn. Soc. xi. p. 194, t. xiii. f. 3. *R. Zetlandica*, F. & H. iii. p. 78, pl. lxxx. f. 1, 2.

SHELL between oval and oblong, turreted or scalariform, solid, nearly opaque, glossy when living or fresh: *sculpture*, fine and rather sharp longitudinal ribs, of which there are 16 on the last whorl, 15 on the penultimate, 14 on the next, and 13 on the succeeding whorl, where they usually disappear; the ribs on the body-whorl do not extend quite to the base, but are cut off by a strong keel or ridge which winds spirally round that part from the upper corner of the mouth; between this keel and the mouth is a deep groove or depression, which partly arises from the prominence of the keel, and is indistinctly ribbed across; there is also a slighter and incomplete ridge (sometimes two) near the mouth, between the basal keel and the inner lip; the labial rib is exceedingly thick and prominent; its edge on the side of the mouth is furrowed or furnished with a double ridge, the inside one of which forms the outer lip; the last four whorls are covered with spiral ridges equal in size and prominence to the longitudinal ribs, and intersecting them at a right angle, so as to produce a series of square excavations; the points of intersection are muricated or spiky; the last whorl has 4 of these ridges (besides that at the base), each of the next two whorls has 3, and the succeeding whorl 2, the uppermost whorls being spirally and delicately striated; the ridges extend to the mouth: *colour* clear-white, sometimes golden-yellow, especially the basal ridge: *spire* rather short, abruptly pointed: *whorls* 6–7, convex, the last occupying three-fifths of the spire, the first minute and rounded: *suture* very deep and channelled: *mouth* roundish-oval, considerably expanding outwards: *outer and inner lips* forming a continuous and slightly elevated rim. L. 0·125. B. 0·075.

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* Inhabiting the Shetland seas.

Habitat: Sparingly found in the coralline and deep-sea zones, Guernsey (Barlee and others), Porth Curnow Cove, Cornwall (Miss Lavars), Hayle (Hockin), co. Antrim (Hyndman and J. G. J.), Lamlash, Bute (Landsborough), Skye and Hebrides (J. G. J.), St. Fergus bay, Peterhead (Bingham, *fide* Brown), Aberdeenshire (Dawson), Caithness (Gordon), Orkneys (Thomas), Shetland (Fleming and others), at depths ranging from 18–70 f. Fossil in the Coralline Crag at Sutton (Wood), and in the miocene formation near Vienna (Hörnes). Living on the coast of South Sweden, in 12–75 f. (Lovén and Malm), Cherbourg (Récluz), off Vigo Bay (M‘Andrew), Antibes (Macé), Nice (Vérany), and Naples (Philippi).

With respect both to this and the next little shell, we may well say with Cicero, “Quid potest esse aspectu pulchrius?”

The synonyms are *R. cyclostomata* of Récluz, *R. obtusa* of Brown, *R. scalariformis* of Metcalfe (Thorpe’s ‘British Marine Conchology’), and *R. clathrata* of Philippi.

11. R. COSTA'TA*, Adams.

Turbo costatus, Ad. in Tr. Linn. Soc. iii. p. 65, t. 13. f. 13, 14. *R. costata*, F. & H. iii. p. 92, pl. lxxviii. f. 6, 7.

BODY clear-white: *snout* long, cloven vertically at the extremity, and exposing the buccal disk, which is pale-red: *tentacles* slender, flattened, apparently not setose: *eyes* large: *foot* long, rounded in front, where it has a snow-white mark like the letter Y, behind which it is constricted at the sides and divided across, thence somewhat expanding, and tapering to a blunt point behind: the lower lip or edge of the foot in front extends much beyond the upper lip: *opercular lobe* dilated into rounded lateral wings: *appendage* single, distinct.

SHELL oblong and slender, obliquely twisted, solid, nearly opaque, glossy when inhabiting clean ground, but usually lustreless: *sculpture*, ridge-like, sharp, high-shouldered, and flexuous longitudinal ribs, of which there are 9 on the last whorl, 10 on the penultimate, 11 on the next, and 12 on the succeeding whorl, where they mostly disappear; the ribs on the body-whorl do not extend quite to the base, being cut off by a strong (sometimes double) keel or ridge which winds spirally round that part; between this keel and the mouth is a deep groove or depression caused by the prominence of the keel; the labial rib is thicker than any of the rest, and its inside edge is flattened and finely notched; the last four or five whorls are covered with numerous delicate spiral striæ, which cross the ribs; the top whorls are quite smooth: *colour* clear-white, with a slight golden tinge: *spire* long and pointed: *whorls* 6, compressed, the last occupying three-fifths of the spire, and the first being minute and rounded: *suture* deep: *mouth* roundish-oval, expanding outwards: *outer and inner lips* sinuated, continuous, and forming a complete and slightly elevated rim round the mouth: *operculum* ear-shaped, thin, yellowish-horncolour, with a small excentric spire, and finely striated. L. 0·125. B. 0·06.

HABITAT: Coralline and lower part of the laminarian zones; more generally distributed in the south than in the north. Dr. Gordon and Mr. Dawson find it on the coast of Aberdeenshire; I have dredged it in the Hebrides; and Mr. Barlee sent me specimens from Shetland. It is rather common in the Channel Isles, and occurs there at the base of seaweeds on the recess of high spring tides. Fossil in Sussex (Godwin-Austen), Largs in Ayrshire (Landsborough), Palermo and Tarento (Philippi). Its northern limits comprise Norway, Sweden, and Holland; and southwards it ranges along the shores of the North Atlantic as far as the Canaries (M'Andrew), and of the Mediterranean on both sides: the depths given by different observers vary from 4–70 f.

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* Ribbed.

Mr. Clark remarked the rapidity and freedom of its movements. In showing that it is a true *Rissoa*, he said "it is a very simple creature." This, of course, he meant in a zoological and not psychological sense. Specimens from Teneriffe and Spezzia are uncommonly small.

It is the *Turbo lacteus* of Donovan—in index, "*Turbo parvus* (*lacteus*),"—*T. crassus* of Adams's work on the Microscope, *T. plicatus* of Mühlfeld, *R. exigua* of Michaud, and *R. carinata* of Philippi. *R. costata* of Desmarets is the *R. variabilis* of Mühlfeld, and very different from the present species.

C. Mostly ribbed lengthwise and spirally striated; outer lip usually strengthened by a rib.

12. R. PARVA*, Da Costa.

Turbo parvus, Da Costa, Br. Conch. p. 104. *R. parva*, F. & H. iii. p. 98, pl. lxxvi. f. 2, 6, lxxvii. f. 6, 7, and lxxxii. f. 1–4.

Body pale-yellowish-white, with a purplish blotch in the middle, and sometimes more or less tinged in other parts with the latter colour: *pallial filament* occasionally protruded: *snout* narrow and deeply cloven: *tentacles* whitish, extensile, somewhat flattened, finely scalloped at the edges, and covered with minute cilia, which are not easily perceptible unless by using a strong magnifying power: *eyes* on short stalks, occasionally nearly sessile: *foot* squarish or slightly rounded in front, contracted in the middle, where it is apparently divided across into two unequal portions (the front being about half the size of the other portion); it tapers behind to a blunt point; sole speckled with frosted white, and finely slit from the centre down to the tail: *opercular lobe* large, dark-purple: *appendage* cylindrical, slender, rather long, and whitish, placed over the tail or hinder part of the foot, and now and then projecting beyond it; it is microscopically ciliated, and resembles a small auxiliary tentacle.

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* Little.

Shell conic-oval, rather solid, nearly opaque, somewhat glossy: *sculpture*, strong and slightly curved ribs, like buttresses, of which there are 8 on the body-whorl, and 12 on the penultimate and next whorl (the succeeding whorls having no ribs); the ribs do not extend to the base; their interstices are frequently cancellated, and their termination on the lower part of the last whorl defined by more or less distinct spiral striæ, arising from the intensity or concentration of microscopical lines which cover the whole surface in that direction; the labial rib is thick and white, placed at a short distance behind the outer lip: *colour* mostly pale yellowish-white, sometimes brown or chocolate, obscurely marked occasionally with rays between some of the ribs, and with a band round the base, always having a falciform streak from the suture behind the labial rib towards the middle of the outer lip; the rays, band, and streak are chestnut-brown; sometimes the ribs are white, the tip is pinkish, and the mouth is edged with chestnut-brown: *spire* short, bluntly pointed: *whorls* 6–7, convex, the last occupying nearly two-thirds of the spire: *suture* rather slight, but distinct: *mouth* roundish-oval, somewhat expanded: *outer lip* thin, contracted and incurved above: *inner lip* reflected on the pillar and at the base, where there is no appearance of an umbilical crevice: *operculum* thin, whitish, with a small excentric spire, and delicately striated. L. 0·165. B. 0·1.

Var. 1. *interrupta*. Smaller, slenderer, thinner, semitransparent, and ribless, with much less convex whorls, usually marked with longitudinal rays of chestnut-colour, which are curved on the body-whorl, or divided into two rows, so as to make the middle appear girdled with a whitish band; occasionally these rays become confluent and form dark bands; labial rib slighter; the spiral striæ are sometimes distinct, although irregular. *Turbo interruptus*, Adams in Tr. Linn. Soc. v. p. 3, t. i. f. 16, 17.

Var. 2. *exilis*. Dwarf, very slender, thin and smooth, tawny, without any conspicuous markings; labial rib wanting or rudimentary.

HABITAT: Swarming on seaweeds and *Zostera* at low-water mark and throughout the laminarian zone. According to Alder a variety has been taken among corallines from 20 f. The typical form is more common in the south, and the variety *interrupta* in the north; both live together, as well as every conceivable gradation as regards shape, size, solidity, sculpture, and colour. Some are full-ribbed, some half-ribbed, and some have only the traces of ribs on one or other of the larger whorls; but the top whorls are invariably smooth. The 2nd variety was found by me in Lerwick Sound. Sars has recorded the typical form as fossil in the post-glacial beds of Norway, at heights between 40 and 200 feet; and the variety *interrupta* has occurred in upper tertiary deposits in Ireland (Brown), Fort William (J. G. J.), Dalmuir and Clyde beds (Crosskey and others), Uddevalla (J. G. J.), Christiania district, in the newer or post-glacial strata, at 100 feet (Sars), Nice (Risso). The foreign distribution of this species and its principal variety comprises the coasts of Upper and Lower Norway, Sweden, Denmark, Holland, France, Spain, Portugal, Italy, Dalmatia, Greece, Algeria, and the Canary Isles, from the shore to 40 f. In the 'Zoological Record' for 1864, von Martens questions the *R. obscura* of Philippi (which is the typical form of this species) being Mediterranean, because he had not found it there. It is not uncommon at Spezzia.

Lying on a rock by the brink of a seaweed-covered pool left by the receding tide, it is no less pleasant than curious to watch this active little creature go through its different exercises—creeping, floating, and spinning.

It has evidently no fear of man or fish, being fortunately unconscious that the conchologist and the blenny are its natural enemies. Its heart, however, beats fast in confinement, giving about 60 pulsations per minute. Clark informs us that "the branchial plume consists of 15–18 minute vessels attached under and to the mantle and back of the neck;" and according to Mr. Alder the teeth are arranged in 40 or 50 rows. The spawn-capsules are semicircular, yellowish-brown, and sometimes deposited on the shells of other individuals. Specimens from the Hebrides and Shetland are much larger than usual, but of a paler hue. The one noticed and figured in the 'British Mollusca' as *R. Sarsii* is an extraordinarily fine example of the variety *interrupta*, and not Lovén's species of that name; it is a quarter of an inch long. Mediterranean specimens are very inferior in size to those of our coasts. Mr. Williams Hockin has noticed that now and then the ribs are slightly furrowed down the middle. This species may always be known from any of its allies by a character which Forbes and Hanley pointed out, viz. the falciform streak outside the mouth.

To give all the old synonyms (including those of Adams) would be unnecessary. The modern ones are *Cingula alba*, Fleming, *R. pulchella*, Forbes, *R. tristriata*, Macgillivray, *R. fuscata* and *R. discrepans*, Brown, *R. obscura* and *R. simplex*, Philippi, *R. Matoniana*, Récluz, *Sabanæa paucicostata* and *Persephona Scotica*, Leach, and *R. cerasina*, Brusina. Perhaps *R. lineolata* and *R. marginata* of Michaud may be added to the list.

13. R. INCONSPI'CUA*, Alder.

R. inconspicua, Ald. in Ann. & Mag. N. H. xiii. p. 323, pl. viii. f. 6, 7; F. & H. iii. p. 113, pl. lxxvi. f. 7, 8, and lxxxii. f. 5, 6.

BODY white, with blotches of yellow: it is also marked lengthwise with two lines of dark-purple or black, the upper one being on the side of the back, and the lower bordering the foot: *pallial filament* pendent: *snout* short, wedge-like, and bilobed, tinged with muddy yellow or orange: *tentacles* very long and slender, hairy: *eyes* black, on minute yellow prominences: *foot* narrow and extensile, slightly labiated in front, bluntly pointed behind; sole depressed in the centre, from which a line runs to the tail: *opercular lobe* expanded beyond each side of the foot, and margined with deep-purple or black, forming with the lines on the upper surface a dark blotch: *appendage* very long and distinct, projecting above the tail. (Alder and Clark.)

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* Not remarkable.

Shell conic-oval, moderately solid, semitransparent, highly glossy, and sometimes having a prismatic lustre: *sculpture*, usually numerous fine stria-like and curved longitudinal ribs on all except the topmost whorls; these ribs are unequally distributed, and occasionally are fewer and stronger on the body-whorl; labial rib thick and white in adult specimens, now and then forming a varix in the middle of the last whorl; the surface is also more or less distinctly impressed by delicate spiral striæ, especially about the periphery; the uppermost whorls are quite smooth: *colour* pale yellowish-white or whitish, rarely milk-white, sometimes variegated by obscure spots or short streaks of reddish-brown; tip of the spire pink: *spire* mostly short and acute: *whorls* 6–7, somewhat convex, but not tumid; the last occupies about three-fifths of the spire: *suture* well defined, although not deep: *mouth* roundish-oval: *outer lip* thin, contracted at the upper corner: *inner lip* thickened and slightly reflected at the base, where there is a small umbilical crevice: *operculum* resembling that of the next species, except that this is fawncolour. L. 0·085. B. 0·05.

Var. 1. *ventrosa*. Thinner, with the whorls more swollen, but having the peculiar sculpture and other characters of this species.

Var. 2. *variegata*. Much smaller, more conical, with an angular periphery, smooth or having a few ribs only, with flatter whorls and distinct broad tawny longitudinal streaks or rays: there is no umbilical cleft. *R. variegata*, v. Mohrenstern, Riss. p. 28, t. ii. f. 15.

Monstr. Slightly scalariform, the last whorl being partly detached from the preceding one.

Habitat: Coralline zone everywhere; especially common in trawl-refuse at Plymouth. The 1st variety was dredged by Mr. Barlee at Exmouth and in the Hebrides, and by myself in the estuarine river Roach in Essex; the 2nd, although widely distributed, seems more to frequent the Dorset coast; and the monstrosity is from the west of Scotland (Barlee) and Aberdeenshire (Dawson). Mr. Robertson has found this species in a post-tertiary deposit at Crinan; the late Dr. Woodward enumerated it as a fossil of the Norwich Crag; and Professor Sars records it from a post-glacial bed in Norway, at a height of 50 feet. It inhabits the Norwegian coast as far north as Oxfjord in the laminarian zone (Sars), Christianiafiord (J. G. J.), the south of Sweden (Malm), the Cattegat (mus. Copenhagen), north of France (Macé, Cailliaud, and Taslé), Gulf of Lyons (Martin, *fide* Petit), Dalmatia (Brusina), Spezzia (J. G. J.), Corsica (Susini), and Algeria (Weinkauff). A species very closely allied to this, if not a dwarf or southern variety of it, was obtained by Mr. M'Andrew off Teneriffe.

This may have been the *Turbo albus* of Adams (*T. albulus* of Maton and Rackett, not of Fabricius), *R. Balliæ* of Thompson, and *R. maculata* of Brown; but the specific name *inconspicua* is in general use, and must be retained. I regard the 2nd variety as a stunted form. If I had contented myself with examining a few specimens only, I should probably have arrived at the same conclusion that Herr v. Mohrenstern did, and made this variety a separate species; but the comparison on an extensive scale of both forms and of intermediate specimens has convinced me that such a distinction cannot be maintained. The shell described—or rather shadowed forth—by Adams as *Helix variegata* may not even have belonged to the present genus. All the species of *Rissoa* which can be safely identified with his descriptions or figures were placed by him in the genus *Turbo.*

14. R. ALBEL'LA *, Lovén.

R. albella, Lov. Ind. Moll. Scand. p. 25. *R. inconspicua*, var. *tenuis*, F. & H. iii. p. 115, pl. lxxxiii. f. 7, 8.

BODY yellowish-white, with a purplish blotch in the middle: *pallial process* single, issuing from the upper angle of the mouth of the shell: *snout* rather short, deeply cloven lengthwise, not extending as far as the foot: *tentacles* cylindrical, with blunt tips, usually spotted with yellow or opaque-white, and finely setose: *eyes* on very small tubercles: *foot* truncated (occasionally somewhat bilobed) in front, constricted near the middle, and pointed behind; sole slightly grooved in the centre of the posterior half: *appendage* single, leaf-like, flat and large.

SHELL conic-oval, thin, semitransparent, and glossy; *sculpture*, usually a few minute slight spiral striæ, but sometimes also rather sharp and curved longitudinal ribs, of which there are from 12 to 15 on the penultimate whorl; these ribs never cover the uppermost whorls, nor extend to the mouth, and now and then they appear on the middle whorls only; between the labial rib (which rarely occurs on smooth specimens) and the outer lip there is a greater or less space left, so as sometimes to give this rib the aspect of a varix: *colour* yellowish-white of different shades, often variegated by longitudinal reddish-brown or tawny streaks, which are straight and rather numerous on the upper whorls, and more or less flexuous on the body-whorl; the base is occasionally marked with a broad but indistinct tawny band; some specimens are of a bright bronze hue: *spire* varying in length, sharp-pointed: *whorls* 6–7, tumid, gradually increasing in size; the last occupies about three-fifths of the spire: *suture* remarkably deep: *mouth* oval or roundish-oval, not expanding: *outer lip* very thin, contracted and incurved at the upper corner: *inner lip* somewhat thickened, and reflected, especially over the base, where a small umbilical crevice is formed: *operculum* slightly concave, horncolour, with a short spire, and rather strongly striated. L. 0·15. B. 0·075.

Var. *Sarsii*. Thinner, smooth, and seldom having the labial rib. *R. Sarsii*, Lov. *l. c.* p. 15.

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* For *albula*, whitish.

Monstr. Body-whorl spirally and finely but irregularly ridged, the outer lip now and then expanded or contracted above, or a notch formed close to the suture.

Habitat: Bantry Bay at low water (Barlee). The variety is tolerably common on *Zostera* at Southampton, and abundant among seaweeds in the west of Scotland and east of Shetland, associated with *R. parva* var. *interrupta*. The monstrosity is sometimes met with in the latter district. The typical form inhabits Bohuslän (Lovén), Kiel Bay (Meyer and Möbius) and Christiania-fiord (J. G. J.); the variety was found by Professor Sars at Bergen.

My largest specimens are those from Southampton and Loch Carron, some of them measuring 2 lines in length. A dwarf form, which is much less numerous, may be the male. The spawn-cases are generally solitary, semiglobular, membranous, and light-yellowish-brown; the fry emerge from a large round hole at the top, which appears when they are developed.

Mr. Alder was quite right in considering this distinct from *R. inconspicua*; but the name (*tenuis*) which he proposed, being unaccompanied by a published description, must cede to one of these which Lovén has given. It is thinner and considerably larger than *R. inconspicua*, the whorls are more ventricose, the suture is much deeper, and the sculpture very different. It is possible that the present species may have been the *R. similis* of Brown, which was found by the Rev. William Molesworth at Padstow.

15. R. MEMBRANA'CEA*, Adams.

Turbo membranaceus, Ad. in Tr. Linn. Soc. v. p. 2, t. i. f. 12, 13. *R. labiosa*, F. & H. iii. p. 109, pl. lxxvi. f. 5, lxxvii. f. 1–3, and lxxxi. f. 3.

Body pale-yellow, or slightly tinged with brown: *tentacles* subulate, white: *eyes* surrounded by white spaces: *foot* squarish in front and pointed behind; the central or contracted part of the sides is dark-purple: *opercular lobe* of the same hue, and well developed: *appendage* conspicuous and white. (Forbes and Hanley.)

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* Membranous.

Shell conic-oblong, with an oblique outline, varying in solidity according to the nature of the habitat, semitransparent, and more or less glossy: *sculpture*, usually strong, prominent, somewhat curved or flexuous longitudinal ribs, from 15 to 18 of which are on the penultimate whorl: those on the last whorl extend only halfway down, and almost disappear towards the mouth: the upper three whorls are perfectly smooth; the rest of the surface is covered with numerous extremely minute and delicate transverse or spiral striæ, some of which on the lower part of the body-whorl are raised and form slight obsolete ridges; these striæ are never punctured or cancellated as in *R. violacea* and *R. costulata*; the labial rib is remarkably thick, broad and white: *colour* whitish, with sometimes a tinge of yellow or light-brown: the mouth is occasionally of a violet hue or edged with purplish-brown; now and then specimens occur which are light-horncolour and marked with reddish-brown, occasionally zigzag, streaks or blotches: the apex of dark-coloured specimens is pale-violet: *spire* rather short, terminating in a sharp point: *whorls* 7, somewhat compressed; the last occupies about two-thirds of the spire; this is exceedingly large in proportion to the next, and considerably dilated: *suture* rather slight: *mouth* oval, widely expanding outwards: *outer lip* thin: *inner lip* very broad, reflected on the pillar and over the base (in some cases to such an extent as to form an umbilical chink); the angle incident on the junction of the two lips is a right one: *pillar* furnished near its base with a strong tooth-like projection or fold: *operculum* horncolour, with a very small spire, and strongly striated. L. 0·3. B. 0·125.

Var. 1. *minor*. Much smaller, and smooth.

Var. 2. *venusta*. More solid, with a shorter spire and stronger ribs. *R. venusta*, Philippi, Moll. Sic. ii. p. 124, t. xxiii. f. 4.

Var. 3. *elata*. Body light-grey, with small white specks, mottled with brown in front: *snout* short and thick, bilobed at the extremity: *tentacles* thread-shaped and slender, setose: *eyes* on swellings of the tentacles at their outer base: *foot* rounded and double-edged in front, with angular corners, bluntly pointed behind: sole of a paler hue than the rest of the body, closely dappled with white, and having in the centre a short internal process (analogous to the byssiferous stylet of *Mytilus*?), which lies in a slanting direction with the outer point towards the tail: *opercular* lobe of the same colour as the sole: *appendage* whitish and conspicuous. Shell thinner, with a longer spire, often smaller, and usually ribless. *R. elata*, Phil. *l. c.* t. xxiii. f. 3.

HABITAT: *Zostera* and seaweeds, from low tide-mark to a few fathoms, on nearly every part of our coasts; although it is rather local. The 1st variety occurs at Tenby and in Dublin Bay, the 2nd was found at Poole by Mr. Barlee, and the 3rd frequents estuaries and brackish water. The typical form is fossil at Belfast (Grainger); Bute (Smith); Uddevalla (Malm); post-glacial beds in Norway, 50–150 feet (Sars); and Sicily (Philippi, as *R. ventricosa*). Its foreign range in a living state extends from Norway, where it is very large (Lovén and others), to Malaga (M'Andrew), Dalmatia (Brusina), Corfu (Hanley, as *R. elata*), Black Sea (Middendorff, as *R. oblonga* and *R. elata*), Algeria (M'Andrew and Weinkauff), and Canary Isles (v. Mohrenstern), at depths varying from low-water to 35 f. Philippi's specimens of his *R. venusta* were Venetian.

The animal occasionally floats, or suspends itself by a viscous thread. The shell varies greatly in size, thickness, and length of spire; but it may always be known from *R. violacea* and *R. costulata* by its wide mouth, plain and scarcely perceptible transverse striæ, and the tooth or fold on the pillar.

The synonyms are inconveniently numerous. Some of them are (either certainly or probably) *Turbo costatus*, Pulteney, *T. labiosus*, Montagu, *R. oblonga*, *R. ventricosa*, and *R. hyalina*, Desmarets, *R. grossa* and *R. fragilis*, Michaud, *R. turricula* and *R. pulla*, Brown, and *R. Souleyetiana*, Récluz. *R. cornea* of Lovén may be also a local variety.

16. R. VIOLA'CEA *, Desmarets.

R. violacea, Desm. in Bull. sc. soc. phil. Paris, p. 8, pl. i. f. 7. *R. rufilabrum*, F. & H. iii. p. 106, pl. lxxvii. f. 8, 9.

BODY orange-white, striped in front with purplish-brown: *mantle* not exhibiting any process: *tentacles* slender, setose, marked lengthwise with an orange line: *eyes* conspicuous on bulbs at the outer base of the *tentacles*: *foot* rounded and double-edged in front; sole constricted in the middle to such an extent that the front part of the foot appears to issue from the hinder part, as if out of a sheath, and it is finely grooved lengthwise towards the tail: *appendage* single, short, and conical; it proceeds from the hinder edge of that lobe of the mantle which forms the operculum.

SHELL conic-oval inclining to oblong, solid, nearly opaque, rather glossy: *sculpture*, usually strong, prominent, and slightly curved longitudinal ribs, about 15 of which are on the penultimate whorl, those on the last whorl being present only on the under side; there are none on the upper whorls, which are quite smooth; near the mouth is a very large and broad labial rib or callus; the interstices of the ordinary ribs and the ribless part of the last whorl are covered with numerous rows of fine transverse striæ, which are regularly and closely punctured: *colour* whitish, frequently tinged with yellow, reddish-brown, violet, or purple; some specimens are marked lengthwise by reddish-brown streaks, especially on the upper part; the tip is usually orange; the outside edge of the labial rib is mostly tawny, and the inside of the lip violet: *spire* short, more or less abruptly tapering to a fine point: *whorls* 7, rather tumid: the last occupies nearly three-fifths of the spire, and is somewhat compressed and dilated towards the mouth: *suture* slight, overlapping the preceding whorl: *mouth* roundish-oval, wide, and slightly expanding in every direction: *outer lip* thin: *inner lip* broad, reflected on the pillar and towards the base: *operculum* horncolour, thin, composed of three rapidly increasing volutions, and marked with very fine and close flexuous striæ in the line of growth. L. 0·2. B. 0·1.

Var. 1. *ecostata*. Destitute of the ordinary ribs.

Var. 2. *porifera*. Body yellowish and stained with dark-purple on the upper side, whitish on the under side: *mantle* fringed with fine and short cilia, and furnished at the left hand or upper corner with a long but slight filamental process: *snout* comparatively large, bilobed: *tentacles* cylindrical, long and slender, strawcolour with a yellowish-brown streak down the middle of each, thinly clothed with fine and short hairs resembling those on the border of the mantle: *eyes* on small offsets: *foot* divided into two parts; the front part is transversely oblong, and the hinder part is triangular, or shaped like a spear-head, and ends in a blunt point; the line of division is margined by a purple border: *appendage* long. Shell thinner, ribless, and horncolour, with a much shorter spire. *R. porifera*, Lovén, Ind. Moll. Scand. p. 24.

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* Violet-coloured.

HABITAT: Laminarian zone, in Guernsey, Hants, Sussex, Dorset, and Devon; Barmouth (J. G. J.); Bantry (Barlee); Connemara (Farran and others); Belfast (Thompson and Hyndman); Lough Strangford, 7–20 f. (Dickie); west coast of Scotland, and Shetland (Barlee and J. G. J.). The 1st variety inhabits the last two districts, and the 2nd the West Voe at the Whalsey Skerries in east Shetland. "Subfossile," Nice (Risso); post-glacial bed in Norway, 50 feet (Sars). Living from Finmark to the Cattegat, in 1–40 f., as *R. rufilabrum* and *R. porifera*; north of France to Vigo, the Mediterranean, Adriatic, and Ægean, in 7–25 f., as *R. violacea*; Villafranca (Hanley), as *R. rufilabrum*.

The animal of the variety *porifera* twirls about restlessly at intervals, using its foot as a pivot; the male is not half as large as the female. The shell of the ordinary form varies extremely in size, as well as in the length and sharpness of the spire. Mediterranean specimens are more narrow and slender, and their colour is much brighter, presenting the same analogy that exists between southern and northern specimens of *R. costulata*. That species differs from the present in having a longer and more tapering spire, a smaller base and contracted mouth, and in the striæ being cancellated instead of punctured.

This is probably the *R. Guerinii* of Récluz. The same author also described it as *R. lilacina,* Delle Chiaje as *Turbo Rissoanus,* Chiereghini as *T. Mavors,* Renier as *T. amethystinus,* and Potiez and Michaud as *R. punctata.*

17. R. COSTULA'TA*, Alder.

R. costulata, Ald. in Ann. & Mag. N. H. xiii. p. 324, pl. viii. f. 8, 9; F. & H. iii. p. 103, pl. lxxvii. f. 4, 5.

BODY yellowish, tinged with brown in front: *snout* rather long, wrinkled, and cloven at its extremity: *tentacles* thread-shaped, slender, retractile, finely setose, sulphur-coloured, with a greenish line or vein down the middle of each: *eyes* on small bulgings of the tentacles, at their outer bases: *foot* rounded in front, divided across in the middle, so as to make the anterior and posterior portions appear separate, bluntly pointed behind; posterior half of the sole grooved lengthwise: *appendage* white, retractile.

SHELL conic-oblong, somewhat spindle-shaped in consequence of the apex being pointed and the base narrower than the middle, rather solid, nearly opaque, more or less glossy: *sculpture,* strong, prominent, and nearly straight longitudinal ribs, 10 of which are on the penultimate whorl, those on the last whorl usually disappearing towards the mouth; there are none on the upper three or four whorls, which are quite smooth; near the mouth is a rib, much larger and broader than any of the rest; the ribs on each whorl are either continuous or arranged alternately, so as to appear dovetailed; the spaces between the ribs and the space near the mouth are covered with fine and rather numerous transverse or spiral striæ, the interstices of which are delicately and closely cancellated, especially at the base of the shell: *colour* pale-yellowish or dirty white, often tinged with lilac, or streaked lengthwise with reddish-brown, sometimes pure-white; the ribs are mostly of a lighter hue or whitish, and are therefore conspicuous; the inside edge of the mouth is nearly always lilac or reddish-brown; occasionally the whole surface, except the labial rib, is ornamented by longitudinal zigzag streaks of reddish-brown, and the ribs are encircled by a white line; the tip in worn specimens is frequently purplish: *spire* abruptly tapering to a fine point: *whorls* 8, convex, the lower two being equal in breadth, and the penultimate sometimes even slightly broader than the last; the upper whorls rapidly diminish in size; and those forming the point of the spire are disproportionately small and flattened: *suture* rather deep: *mouth* roundish-oval, contracted and incurved above, slightly expanding at the sides and below: *outer lip* thin beyond the large rib or callus which strengthens the mouth: *inner lip* considerably reflected on the pillar and towards the base: *operculum* pale-horncolour, of three rapidly increasing volutions, and finely striated. L. 0·2. B. 0·075.

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* Slightly ribbed.

Habitat: *Codium tomentosum* and other small seaweeds at low-water, in the Channel Isles and on the coasts of Dorset and Devon; also at Ryde (Hanley); Worthing (Rich); Manorbeer in Pembrokeshire, and Cork (J. G. J.); Scarborough (Bean); Lamlash (Landsborough). Probably the last locality, and certainly Connemara (given by Forbes and Hanley on the late Mr. Thompson's authority), appertains to *R. violacea*, instead of to the present species. *R. costulata* inhabits the northern and western coasts of France (Macé and others), Gijon, Corunna, and Vigo (M'Andrew), and both sides of the Mediterranean. Specimens from that sea are smaller and more slender than those from the North Atlantic. There are two sizes everywhere, apparently representing a difference of sex.

I found a living specimen at Lulworth which had the lower half broken off and a new mouth formed among the ruins.

It is not *R. costulata* of Risso (which is *R. costata*, Desmarets, and *R. variabilis*, v. Mühlfeld), nor *R. costulata* of Searles Wood, from the Coralline Crag. Leach called the present species *Persephona Goodallana* and *P. rufilabris*, judging from his description of the former, and from typical specimens of the latter in the British Museum. It is also the *R. subcostulata* of v. Mohrenstern. I regard *R. similis* of Scacchi as a small variety.

18. R. STRIA'TA*, Adams.

Turbo striatus, Ad. in Tr. Linn. Soc. iii. p. 66, t. 13. f. 25, 26. *R. striata*, F. & H. iii. p. 94, pl. lxxviii. f. 8, 9.

Body white, with a tinge of yellow: *pallial filament* nearly hyaline, and pendent: *snout* rather long and narrow: *tentacles* cylindrical, very finely and closely ciliated: *eyes* black, almost sessile: *foot* narrow, truncated in front and slightly auricled, contracted in the middle, and tapering behind to a round point: *appendage* short, white, and pointed.

Shell oblong, inclining to cylindrical, rather solid, nearly opaque, and usually lustreless: *sculpture*, numerous thread-like spiral striæ, of which there are about 20 on the body-whorl; frequently the upper part of each of the three next whorls (and occasionally also the body-whorl) has a few longitudinal slightly flexuous ribs, that reach only about halfway down and are crossed by the spiral striæ; the two uppermost whorls are quite smooth and glossy: *colour* white or various shades of yellow, with sometimes two indistinct but broad reddish-brown bands round the middle of the last whorl, which do not extend to the mouth: *spire* elongated, with a blunt point: *whorls* 6, somewhat compressed, gradually enlarging, the last two being nearly equal in breadth, and the largest occupying about three-fifths of the spire: *suture* very distinct and rather deep: *mouth* proportionally small, having a somewhat flexuous outline: *outer lip* thin, mostly strengthened outside by a thick rib: *inner lip* reflected, and forming with the other lip a complete peristome: *operculum* transparent, and delicately striated. L. 0·125. B. 0·05.

Var. *arctica*. Without longitudinal ribs or coloured bands. *R. arctica*, Lovén, Ind. Moll. Scand. p. 24.

Habitat: All our coasts, under stones and at the base of seaweeds on the recess of spring tides; living in clusters. It inhabits also the laminarian and coralline zones; and I have dredged it in upwards of 80 fathoms.

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* Striated.

The variety is more peculiar to the north, although occurring everywhere with the typical form. As an upper tertiary fossil this variety has been noticed in Ireland (Brown), Clyde beds (Crosskey), Fort William (Bedford and J. G. J.), post-glacial deposits in Norway, 130 feet, and glacial shell-banks in Aremark, Norway, 280–460 feet (Sars), and Coralline Crag (S. Wood). Its foreign range comprises Spitzbergen (Torell), Greenland (Möller), Sea of Okhotsk and coast of Russian Lapland (Middendorff), Iceland (Steenstrup), and Scandinavia (Lovén and others), 0–50 f., where the typical form also occurs: this last ranges from Heligoland (Philippi) to Corunna and Vigo (M'Andrew), and thence to the Gulf of Lyons (Martin) and the Ægean in 20 f. (Forbes). M'Andrew found a dwarf variety at Teneriffe. The variety *arctica* (under the specific name *aculeus*, given to it by Professor Stimpson) inhabits the northern sea-board of the United States.

This little creature is by no means shy or sluggish. It probably feeds on decayed seaweeds. Females are the better halves in point of size. Some specimens are slender, some ventricose, some of thin texture and delicately striated, others are distorted by being twisted on one side in the most lackadaisical fashion. Those from deep water are much smaller than littoral specimens.

Synonyms:—*R. minutissima*, Michaud, *R. communis*, Forbes, *R. gracilis*, Macgillivray, *R. decussata*, *Pyramis candidus*, and *P. discors*, Brown, and *R. pedicularis*, Menke. The young is the *Turbo semicostatus* of Montagu and *Odostomia Marionæ* of Macgillivray, and the variety is the *R. saxatilis* of Möller. Philippi considered a species which he described in the 'Zeitschrift für Malakozoologie' for 1849 as *R. delicata* (from the Red Sea) to be a tropical variety of our *R. striata*.

D. Spirally striated, or smooth; outer lip plain.

19. R. PROX′IMA*, Alder.

R. proxima (Alder), F. & H. iii. p. 127, pl. lxxv. f. 7, 8.

BODY brilliant and almost clear white, dotted with minute opaque-white flakes: *mantle* even, and (as well as the next species, *R. vitrea*) not exhibiting the usual filamental process: *snout* somewhat cylindrical and extensile, quite smooth and rounded at its extremity, where it forms a rose-like disk; when fully extended it is blotched at the sides and on the tip with claret-red: *tentacles* rather short, flat, strong, tapering, and minutely bulbous at the tips, each of which is clothed with six comparatively long and fine needle-shaped hairs: *eyes* remarkably large, black, and placed on minute and nearly semicircular lateral excrescences at the outer bases of the tentacles, which are so amalgamated with them as scarcely to present any prominence: *foot* large, fleshy, grooved and slightly labiated in front, with a deep notch or indentation, and expanded into large, long, arched, and pointed auricles; it is divided behind into two long distinct and diverging tails or streamers: *opercular lobe* close to the point of such bifurcation, and destitute of a caudal cirrus. (Clark.)

SHELL closely resembling the next species (*R. vitrea*) in shape and size; but it is never lustrous; and when examined with even a low magnifying power, instead of being smooth it is seen to be encircled by numerous distinct and rather spiral striæ; the colour is snow-white beneath a pale-yellowish epidermis; the spire tapers more gradually, and has a somewhat abruptly truncated apex; the whorls are compact, and not loosely coiled; the inner lip is more closely attached to the pillar; and the operculum is white, formed of 4 or 5 volutions, and marked with delicate striæ in the line of growth.

HABITAT: Exmouth, eight miles from shore, in 15 f., on a bottom of shells and mud (Clark); Torbay and Plymouth, in 15–20 f., with *R. vitrea* (J. G. J.); Falmouth (Barlee); Helford (Hockin); Cork, Bantry, and Dublin (J. G. J. and others). Mr. Searles Wood has lately found two specimens in the Coralline Crag at

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* The nearest, *i. e.* to *R. vitrea.*

Sutton. Its foreign known or supposed distribution is southern and limited, as follows:—Gulf of Lyons (Martin); Spezzia (Doria and J. G. J.); Ajaccio (Requien); Naples (Tiberi); Teneriffe (M'Andrew).

R. proxima appears to be a rare as well as "critical" species. Besides its affinity to *R. vitrea*, it is nearly related to the variety *arctica* of *R. striata*. In the last-named species, however, the texture and sculpture of the shell are coarser, the spire is pointed and not truncated, and the suture is less deep and not so oblique. The present species may be distinguished from *R. vitrea* by its being striated and never glossy. May one be the male and the other the female of the same species?

It is probably the *R. pupoides* of Requien. I described it about twenty years ago in the 'Annals of Natural History' as *R. striatula*, not remembering that the name had been preengaged for a supposed Linnean species.

20. R. VI'TREA*, Montagu.

Turbo vitreus, Mont. Test. Br. p. 321, t. 12. f. 3. *R. vitrea*, F. & H. iii. p. 125, pl. lxxv. f. 5, 6.

BODY white, and appearing as if veined, with a frosty hue: *snout* short, cloven at the extremity, fleshcolour: *tentacles* thread-shaped, long and compressed, setose at the tips only, and serrated at the outer bases: *eyes* conspicuous, placed on small bulbs or eminences: *foot* double-edged in front and indented so deeply as to form two distinct broad lobes, rounded behind: no *appendage* observable.

SHELL nearly cylindrical, thin, semitransparent, and of a glassy lustre: *sculpture* none, examined with a hand-lens; but under the microscope or even a Coddington lens the surface exhibits extremely fine regular and close-set spiral striæ: *colour* of live or fresh specimens pale yellowish-white, which soon becomes bleached by exposure to the air: *spire* elongated and slender, ending rather abruptly in an obtuse point: *whorls*

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* Glassy.

6, convex, loosely and obliquely coiled, the last three being nearly equal in breadth, and the first minute; the body-whorl occupies nearly two-thirds of the spire: *suture* remarkably deep: *mouth* exactly oval, small, and slightly expanding: *outer lip* thin, contracted, and incurved above: *inner lip* somewhat reflected, and more or less detached from the pillar: *operculum* few-whorled, light-horncolour, with the spire placed excentrically. L. 0·135. B. 0·05.

HABITAT: Mud in the coralline zone, Dorset, Devon, Cornwall, Bristol and English Channels; Northumberland coast (Alder); south and west of Ireland and Dublin Bay; Dunbar (Bingham, *fide* Brown); Moray Firth (Macgillivray and Macdonald); west coast of Scotland (Barlee and J. G. J.); Orkneys (Thomas); and Bressay in Shetland (Fleming). It is local and somewhat rare. Fossil in the Coralline Crag at Sutton (Wood). Professor Sars has dredged it of a very large size off Floröen in Finmark; Malm obtained forty-five specimens, of which several were living, in 20–30 f. on the Bohuslän coast; La Hogue Bay near Cherbourg (Macé); Vigo (M'Andrew); Gulf of Lyons, in the stomach of *Astropecten irregularis,* with *R. proxima* (Martin); Spezzia (J. G. J.).

Very active, and suspends itself by a single byssal thread, keeping the mouth of the shell closed by the operculum.

Captain Brown made of this species three, which he called *vitrea, crystallina,* and *virginea.* A shell kindly given me by M. Nyst, from the Belgian tertiaries, as *R. vitrea,* is twice as large as our shell; it has an angulated periphery, a shallower and straight suture, fewer though more conspicuous spiral striæ, and an acute-angled outer lip, the inner lip being closely attached throughout to the pillar.

21. R. PULCHER'RIMA*, Jeffreys.

R. pulcherrima, Jeffr. in Ann. & Mag. N. H. ser. 2. ii. p. 351; F. & H. iii. p. 129, pl. lxxv. f. 1, 2.

BODY whitish, with yellow specks: *snout* convex, projecting beyond the foot, and bilobed at the extremity: *tentacles* rather short, thickly and exquisitely setose, with rounded tips: *eyes* large: *foot* slender, rounded in front, divided across in the middle by a fine line (as in many other species of *Rissoa*), and bluntly pointed behind; sole slightly grooved down the middle on its posterior half: *opercular lobe* margined on each side with dark purplish-brown: *appendage* very long and pointed.

SHELL conical with a broad and dilated base, thin, semi-transparent, and glossy: *sculpture* none: *colour* whitish, prettily variegated by 4 rows of reddish-brown spots on the body-whorl, the spots in the upper two and lower two rows (or in the upper two only) being sometimes confluent and forming short longitudinal streaks; the penultimate whorl has 2 or 3 rows, and the next 1 row: *spire* short, ending in a remarkably obtuse and mammiform point: *whorls* 4, ventricose; the last equals three-fourths of the spire, and expands considerably towards the mouth: *suture* very deep: *mouth* nearly round: *outer lip* thin: *inner lip* reflected on the pillar, behind which is a small but distinct perforation: *operculum* thin, impressed with a few strong diverging lines; the nucleus of the spire is rather more central than in any of the preceding species, and resembles that of a *Littorina*. L. 0·075. B. 0·05.

HABITAT: Among small seaweeds and on *Zostera* at low-water in all the Channel Isles; not uncommon. Some years ago, at Exmouth, after washing a quantity of *Corallina officinalis* which I had collected on that coast, I found two or three specimens of *R. pulcherrima*, and I was at first delighted at having discovered a new habitat; but I have since recollected that Mr. Barlee lent me for the examination sieves which he had last used in Guernsey. Such trifling accidents may cause great confusion in our ideas of geographical distribution. I have taken this pretty shell at Sestri di Levante; and

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* Very beautiful.

I observed it in the collections of MM. Susini from Corsica and of M. Macé at Cannes.

It is exceedingly agile both in creeping and swimming, and spins a delicate thread of attachment. Mr. Clark states that this species "is a dwarf, nearly ribless *R. inconspicua*." The latter, however, has a much narrower base, the spire is more tapering and sharp-pointed, and the outer lip is furnished with a rib; and the shell is never so thin in proportion to its size, and is invariably sculptured. I have carefully compared the young and adult of each species, in order to satisfy myself as to their distinctness. *Truncatella fusca* of Philippi is allied to the present species.

22. R. FUL'GIDA*, Adams.

Helix fulgidus, Ad. in Tr. Linn. Soc. iii. p. 254? *R. fulgida*, F. & H. iii. p. 128, pl. lxxxi. f. 1, 2.

BODY whitish, with more or less of a yellow hue, and microscopically suffused with flake-white points: *mantle* not exhibiting any filament: *snout* short, bifid at the point: *tentacles* cylindrical but somewhat compressed, rather short, sparingly and minutely setose: *eyes* large in proportion, on small protuberances of the tentacles, at their outer bases: *foot* flexible, usually rounded in front and bluntly pointed behind; sole grooved lengthwise down the middle on the posterior half. Neither Mr. Clark nor myself could detect any distinct opercular cirrus or appendage—although he says, "in some specimens I have fancied I saw a very short blunt one."

SHELL conic-oval, inclining to globular, rather thin, semitransparent, and glossy: *sculpture* none, even under the microscope: *colour* pale yellow or creamy, with two reddish-brown bands on the body-whorl, one narrower just below the suture, and the other broader below the periphery: there is also a streak of the latter colour on the base; the penultimate whorl is mostly reddish-brown: *spire* very short: *whorls* 4, tumid; the last equals three-fourths of the spire, and is somewhat expanded towards the mouth: *suture* deep: *mouth* nearly round: *outer lip* thin:

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* Shining.

inner lip having sometimes a pink tinge, thickened and slightly reflected at the base, behind which is a small chink: *operculum* ear-shaped, depressed in the centre, with a minute and nearly excentric spire. L. 0·035. B. 0·025.

Var. *pallida*. Strawcolour, without the upper, and sometimes without either band, occasionally having merely a pink or reddish-brown streak on the base.

Habitat: Abundant in the lower part of the littoral zone, among *Zostera marina* and small seaweeds, in the Channel Isles, Dorset, Devon, Cornwall, and the south and west of Ireland. I have also found it sparingly in Langland Bay near Swansea, and Lough Larne near Belfast. Mr. Lyons noticed it at Tenby, and Mr. Norman in the Clyde district. The variety occurred to me feeding on *Zostera* at Lulworth. *R. fulgida* is fossil in Calabria (Philippi). It inhabits the Atlantic and Mediterranean coasts of France, as well as Corsica, Piedmont, Sicily, Dalmatia, and Candia.

This mite of a shell is not half the size of the next species (*R. soluta*), from which it differs in colour, want of sculpture, shorter spire, having the last whorl more expanded, and a less distinct umbilical cleft. It is often encrusted with *Melobesia polymorpha*. Mr. Clark's first impression, adopted by Forbes and Hanley, that the operculum is not spiral, was properly corrected by him in his own work. He says that the animal does not walk straight; that it "often jerks or screws the shell a quarter of a round, and carries it almost perpendicularly;" and that "on the march the eyes are always under the shell, as are usually the muzzle and foot, the ends of the tentacula only being visible." I frequently observed it spinning a fine transparent slimy thread, and thus hanging suspended to a bit of seaweed or to the surface of the water. It also swims freely, like its congeners.

It is the *R. pygmæa* of Michaud, and probably *R. fasciata* of Requien.

23. R. SOLU'TA *, Philippi.

R. soluta, Phil. Moll. Sic. ii. p. 130, t. xxiii. f. 18; F. & H. iii. p. 131, pl. lxxv. f. 3, 4.

BODY pale-yellowish-white, minutely speckled with flaky points: *mantle* lining the mouth of the shell: *filament* conspicuous: *snout* short, having a pink or dull-reddish-brown tinge above, and a patch of bright sulphur-yellow on each side below: *tentacles* cylindrical but somewhat compressed, slender, thickly covered with fine and rather long cilia: *eyes* scarcely raised, usually seen within the shell: *foot* long and narrow, labiated in front and slightly auricled at the corners, bluntly pointed behind: *appendage* very long and distinct, flattish at the base, and tapering to a fine point.

SHELL conic-oval, with a tendency to globoseness, solid for its size, semitransparent, and rather glossy: *sculpture*, extremely fine and somewhat numerous spiral striæ, which are not perceptible except by a very strong magnifier or (in some specimens) under a microscope: *colour* uniform buff or pale-yellowish: *spire* very short, with a blunt point: *whorls* 5, convex, the last equalling two-thirds of the spire: *suture* deep: *mouth* more round than oval: *outer lip* rather thick: *inner lip* reflected at the base, behind which is a small umbilical chink: *operculum* ear-shaped, marked with a few diverging lines of growth. L. 0·05. B. 0·035.

Var. *Alderi*. Larger and thinner, with a more produced and pointed spire. *R. Alderi*, Jeffr. in Ann. and Mag. N. H. ser. 3. iii. p. 127, pl. v. f. 5 *a–c*.

HABITAT: Coralline zone in Shetland, the Hebrides, and Guernsey; also in Dunnet Bay, Pentland Firth, and Moray Firth (Gordon), Aberdeenshire coast (Dawson), Clyde district (Webster and others), Belfast Bay (Hyndman and J. G. J.), Dublin Bay (Kinahan), Cork (J. G. J.), Bantry Bay (Beevor), Arran Isle, co. Galway (Barlee), west coast of Ireland (Hoskyns), Fowey and Kingsbridge (Barlee), Helford (Hockin), Exmouth (Clark), and Plymouth (J. G. J.). The variety occurred to me in the laminarian zone at Skye, and the Whalsey Skerries in the east of Shetland. Fossil in the post-glacial beds of Norway from the present level of the sea to 100 feet above it (Sars). This author has also noticed it living on the Norwegian coasts as far north as Oxfjord in Finmark; I found it at Etretat in Normandy, Martin in the Gulf of Lyons, Macé at Antibes, and Philippi at Sorrento and Palermo. Although local, it is not uncommon.

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* Loose (referring to the convolutions of the spire).

It is an active and restless little creature. I observed in this and other species of *Rissoa* an upward and downward current or movement on the surface of each tentacle, apparently caused by the action of the cilia.

Having carefully compared British and Mediterranean specimens, I still believe that Philippi's description and figure of *R. soluta* fairly represent our shell. It varies considerably in the length and compactness of the spire, as well as in the degree of sculpture. Indeed the striæ cannot be detected in most specimens unless by means of a high magnifying-power, which possibly Philippi was not in the habit of using. He especially mentioned the umbilical fissure that characterizes the present shell. Searles Wood proposed to call our species *intersecta*, in case its identification with Philippi's species should prove to be erroneous; Bean gave it the MS. name of *minutissima*, and Martin that of *globosa*. The last two names I have seen in collections.

24. R. SEMISTRIA'TA *, Montagu.

Turbo semistriatus, Mont. Test. Br. Suppl. p. 136. *R. semistriata*, F. & H. iii. p. 117, pl. lxxx. f. 4, 7.

BODY pale-yellowish-white: *pallial filament* short: *snout* not so long as in many other species, grooved in the centre above, and deeply cloven at the extremity: *tentacles* cylindrical but somewhat compressed, rather long, and covered with close-set cilia: *eyes* on scarcely raised tubercles: *foot* squarish in front, with slightly angular corners, and tapering behind to a blunt point: *appendage* tricuspid and short, placed over the tail but never projecting beyond it.

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* Half-striated.

SHELL conic-oval, rather solid, semitransparent, and somewhat glossy: *sculpture*, on the body-whorl below the suture about half a dozen slight spiral striæ, of which the upper two close to the suture are much stronger than the rest, and about a dozen similar and distinct striæ below the periphery, the intermediate space being faintly also striated or frequently quite smooth; the other whorls exhibit the subsutural striæ only: *colour* pale yellowish-white, with a row of reddish-brown short and broad longitudinal streaks or blotches on the upper part of each whorl, and a second row of smaller and narrower streaks on the lower part, which last are often interrupted or broken; the other whorls are seldom marked in this way: *spire* rather short but pointed, with a blunt tip: *whorls* 6, rounded but not convex, the last occupying nearly two-thirds of the spire: *suture* slight, encircled by the uppermost and strongest stria of each whorl: *mouth* open, though not expanded: *outer lip* sharp: *inner lip* reflected on the pillar and base, united above with the outer lip: *operculum* yellowish, and thin, slightly striated. L. 0·01. B. 0·065.

Var. *pura*. White and spotless.

HABITAT: Littoral and laminarian zones, in England, Wales, Ireland, and Scotland as far north as the outer Hebrides (J. G. J.), Aberdeenshire (Dawson), Moray Firth (Gordon), and Shetland (Barlee). The variety is equally diffused, but more common in Guernsey than elsewhere. Lilljeborg found this species in Norway, and it occurs in the Cattegat; but southwards it becomes more frequent, both on the eastern coasts of the North Atlantic and in the Mediterranean; Adriatic (von Schröckinger); Algeria (Weinkauff).

This pretty little mollusk, which Clark called "a bashaw with three tails," congregates in family groups on the under surfaces of stones laid bare at low water of spring tides. It swims, like its congeners, with the sole of the foot uppermost.

It is possibly the *Turbo scriptus* of Adams, and unquestionably *R. pulchra* of Johnston, *R. tristriata* of Thompson, and *R. subsulcata* of Philippi. *R. semistriata* of the last named author, from the Red Sea, appears to be different from our species.

25. R. CINGIL'LUS*, Montagu.

Turbo cingillus, Mont. Test. Br. p. 328, t. 12. f. 7. *R. cingillus*, F. & H. iii. p. 122, pl. lxxix. f. 9, 10, and (animal) pl. J J. f. 4.

BODY pale-yellowish-white or milk-white; *snout* semitransparent: *tentacles* long, nearly cylindrical, flexible, with somewhat bulbous tips: *eyes* black and conspicuous, sometimes on whitish tubercles: *foot* narrow, but proportionally short, squarish in front and bluntly pointed behind; caudal cirrus not observed.

SHELL conic-oblong, rather solid, semitransparent, and somewhat glossy: *sculpture*, on the body-whorl from 12 to 20 slight spiral ridges, which are sharp and distinct below the periphery, but more or less obsolete above it; these ridges are scarcely perceptible on the other whorls; they are crossed by numerous fine striæ in the line of growth, causing an imperfect decussation; the last whorl is slightly angulated: *colour* buff or yellowish-white, with two chocolate or reddish-brown bands on the last whorl, and one on each of the upper whorls, besides part of a second band above the suture; there is also a third, shorter band or streak at the base; and occasionally, when the bands are narrow, a fourth may be seen between the lower band and the basal streak: *spire* long and gradually tapering, with a blunt tip: *whorls* 6–7, flattened, the last occupying about two-fifths of the spire: *suture* distinct and slightly channelled: *mouth* rather small: *outer lip* sharp: *inner lip* forming a glaze on the pillar, and united with the upper lip at the outer angle: *operculum* horncolour, marked with diverging lines of growth. L. 0·175. B. 0·085.

Var. *rupestris*. Creamcolour or milk-white, and bandless. *R. rupestris*, Forbes in Ann. N. H. v. p. 107, pl. 2. f. 13.

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* For *cingillum*, a small girdle.

HABITAT : Gregarious, between tide-marks, on nearly every part of our shores. The variety is equally diffused, but nowhere so common as at Weymouth and Lulworth. The only locality recorded for this species as fossil is Ireland, on the authority of Capt. Brown. Its foreign range probably extends from Iceland (Zoega, *fide* Linné), along the Scandinavian coast from Bergen, southwards to the Ægean (Forbes). It has been found in several parts of France, Spain, and the north of Italy.

It appears to subsist on decayed seaweeds. Every shade and gradation, as regards the colour and bands, may be observed; and I have a slightly turreted distortion.

Linné's description (in the 12th volume of his 'Systema Naturæ') of *Helix pella* may suit this species; and there is no doubt that it is the *Turbo trifasciatus* of Adams, and *T. vittatus* of Donovan. Although all these names have precedence of that given by Montagu, I must retain his as now universally accepted. Custom wills that, in science as well as in literature, names and words in general use should be preferred to those which are obsolete, although the latter may have the claim of priority; nor will the feeble cry of justice to the memory of the author be listened to while the loud and imperious demand of public convenience is ringing in our ears. Michaud called this species *R. cingilus*, and Macgillivray *R. cingillata*. A variety of a paler hue is Turton's *Turbo graphicus*; and the variety *rupestris* is *R. fallax* of Brown.

The "spurious" or un-English species of *Rissoa* are as follows:—

1. *R. auriscalpium* (*Turbo*, L.) = *T. marginatus*, Mont. = *T. arcuatus*, Dillw. = *R. acuta*, Desm. = *R. acicula*, Risso = *Zippora Drummondii* and *Z. Drummondiana*,

Leach: said to have been found at Dunbar by Laskey—an authority not to be relied on, seeing that *Tellina carnaria, Amphidesma nitens, Siliquaria bidens,* and several other exotic shells are enumerated by him from that locality; Dunbar also (Bingham, *fide* Brown); Cork (Leach). It is a common Mediterranean shell.

2. *R. disjuncta* (*T. disjunctus,* Mont.). West-Indian.

3. *R. Montagui,* Payr. = *R. Binghami,* Brown: St. Fergus's Bay, Peterhead (Bingham, *fide* Brown). Mediterranean and Adriatic.

4. *R. glabrata,* v. Mühlf. = *R. punctulum,* Phil. = *R. nitida,* Brusina: Shetland and Skye (J. G. J., in consequence of sifting shell-sand through sieves which were not properly cleaned after I had used them on the Piedmontese coast). Mediterranean and Adriatic.

5. *R. cimex* (*Turbo,* L.) = *T. calathiscus,* Mont. = *Alvania Europea, A. mamillata,* and *A. Fremingvillea,* Risso = *R. cancellata,* Desm. = *R. granulata,* Phil.: Isle of Jura (Laskey); Cumbrae (J. Smith). Mediterranean and Adriatic.

In the same category may be placed several species of *Rissoina,* a genus instituted by D'Orbigny to receive certain shells allied to *Rissoa,* which have the lower part of the mouth slightly channelled, and the operculum furnished underneath with a process like that of *Neritina.* There is no British species of *Rissoina.* Those erroneously recorded as such are:—

1. *Rissoina Bruguieri,* Payr.: Scarborough (Bean). Loire-Inférieure (Cailliaud); north coast of Spain (M'Andrew); Adriatic (Heller); Mediterranean (Payraudeau and others); Ægean (Spratt).

2. *Rissoina Bryerea* (*Turbo Bryereus,* Mont.) = *T. costatus,* Don.: Margate (Donovan); Weymouth (Bryer); Dunbar (Laskey); Cornwall, Portmarnock, and Firth of

Forth (Brown); Peterhead (Crombie, *fide* Macgillivray). West Indian.

3. *Rissoina decussata* (*Turbo decussatus,* Mont.) = *R. pyramidella,* Brown: Weymouth (Bryer); Portobello Sands (Laskey); Dunbar (Brown). West-Indian.

4. *Rissoina conifera* (*Turbo coniferus,* Mont.): Weymouth (Bryer); north of France (De Gerville). West-Indian.

5. *Rissoina denticulata* (*Turbo denticulatus,* Mont.): Weymouth (Bryer); Cornwall and Dunbar (Brown); Herm (Lukis). West-Indian.

The following are irrecognizable:—1. *Rissoa sulcata,* Brown: Dunbar (Bingham). Apparently a *Rissoina.* 2. *Rissoa candida,* Brown: "Belton Sands near Dunbar." Perhaps the same species as the last. 3. *Rissoa lactea,* Brown (not of Michaud): "Dunbar." Another *Rissoina,* probably *R. Chesnelii* of Michaud, a native of the West Indies and Mauritius.

Genus IV. HYDROBIA.

(See vol. i. p. 63.)

I would remind my readers that the chief characters by which the present genus is distinguishable from *Rissoa* (to which it is closely allied) consist in the foot of *Hydrobia* wanting the opercular appendage or caudal filament, and in *Rissoa* being truly marine, while this lives in estuaries and brackish water only. In the latter respect both genera may be regarded as the creatures of habitat. Their shells are equally small.

When I placed *Hydrobia* in the *Paludinidæ,* I had not sufficiently considered its systematic relations. I now withdraw it from that family. The description of the operculum (vol. i. p. 55) must be amended by omitting the words "or paucispiral."

Hydrobia ulvæ*, Pennant.

Turbo ulvæ, Penn. Br. Zool. iv. p. 132, t. lxxxvi. f. 120. *Rissoa ulvæ*, F. & H. iii. p. 141, pl. lxxxi. f. 4, 5, 8, 9, pl. lxxxvii. f. 2, 8, and (animal) pl. JJ. f. 8.

Body light-slatecolour, dark-grey, or sootcolour, with more or less of a purple tinge, speckled with yellow, and having occasionally a few markings of purple-brown on the upper part: *pallial process* thread-shaped, short, and ciliated: *snout* nearly cylindrical, prominent, and extensile, cloven at the extremity, edged in front by a purplish-brown line, and having two yellow spots in the middle: *tentacles* thread-shaped but somewhat compressed, long, slender, and diverging, irregularly speckled with yellow, marked across a little below the tips by a bar or ring of purplish-brown, and edged with the same colour; they are covered with fine and short, but not conspicuous, vibratile cilia, and often (especially the left-hand tentacle) scalloped or serrated at the sides, like the weapon of a sword-fish, apparently in consequence of voluntary contraction; tips rounded: *eyes* on small protuberances: *foot* lanceolate, squarish and double-edged in front with short salient corners, narrower in the middle, and rounded behind; it is margined with a narrow purplish-brown line; sole light-grey, with yellow specks: *opercular lobe* large and expanding on each side, darkpurplish-brown; it has no filament, process, or appendage of any kind.

Shell oblong, rather solid, opaque, and of a dullish hue: *sculpture*, under a hand-lens exhibiting occasionally a few slight spiral lines on the last whorl; with a higher microscopic power may be detected on all the whorls extremely fine, close-set and numerous concentric wavy striæ; there are also the usual longitudinal lines of growth; the body-whorl is more or less distinctly keeled in the middle: *colour* yellowish or reddish-brown of various shades passing into horncolour: *epidermis* very thin, and mostly obscure: *spire* rather long and tapering, with a blunt tip: *whorls* 7-8, compressed, the last occupying about one-half of the spire viewed in a supine position: *suture* well-defined although not deep: *mouth* oval, narrowly angulated above, and effuse or spread out below, where it is also somewhat angular: *outer lip* thin and plain: *inner lip* white, reflected on the pillar and over the base of the shell, behind which it forms a small cleft or umbilical chink; the lips are continuous and make a complete peristome: *operculum* horny and thin, marked with flexuous and rather strong lines of growth, and having a small lateral spire of three whorls. L. 0·25. B. 0·125.

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* Inhabiting *Ulva lactuca*.

Var. 1. *albida*. Of a whitish colour.

Var. 2. *Barleei*. Smaller and spindle-shaped, the last whorl being contracted at the base, and the mouth much smaller than usual. *Rissoa Barleei*, Jeffr. in Ann. & Mag. N. H. xix. p. 310.

Var. 3. *octona*. Smaller, thin, glossy, and horncolour, with the whorls more slowly increasing and divided by a deeper suture. *Helix octona*, Linn. S. N. p. 1248.

HABITAT: All our tidal rivers, inlets, and bays; covering mud-flats and oozy sands in countless profusion. Var. 1 is occasionally found. Var. 2. Hebrides (Barlee and J. G. J.); the typical form occurs in Loch Carron and at Stornoway. This variety is littoral—although the specimens (dead ones) which I described as *Rissoa Barleei* were dredged in deep water, having accidentally got there. Lindström noticed the same variety on the eastern shores of the Baltic. Var. 3. In a large pool of brackish water, called Arnold's Pond, near Grand Havre Bay, Guernsey. This last variety inhabits the southern shores of the Baltic; and M. Taslé sent me specimens from Brittany. It may be a distinct species; but we do not know the effect of local conditions and consequent change of food on the shape of animals. *H. ulvæ* is fossil in a post-tertiary deposit at Belfast (Grainger), Clyde beds (Smith and Crosskey), Norwich Crag (Woodward), Red and Coralline Crag (S. Wood), Uddevalla (J. G. J.), Norway, in post-glacial beds (with the variety *Barleei*), from the present level of the sea to 130 feet above it (Sars). Its foreign range extends from Finmark to Spain and throughout the Mediterranean; and Dr. Philip Carpenter has recorded it as a native of the Gulf of California. An allied species (*Turbo minutus,* Totten) appears to be its representative on the east coast of North America; this has a smaller and more oval shell, with convex whorls.

"In summer it is the chief food of the grey mullet; in winter various sea-birds feed upon it" (Hyndman). Its own subsistence is derived from *Enteromorphæ, Confervæ,* and other delicate seaweeds; and I can testify that it can fast a long while, having kept live specimens for many days in a vessel which contained nothing but water, without observing any diminution of their vivacity. Males are very much smaller than females (from which my description has been taken), and their shells have no keel. The former sex is probably the *Turbo subumbilicatus* of Montagu. The hollow space between the two edges in front of the foot is lined with vibratile cilia, by the action of which a fluctuating motion is produced when the animal is crawling, and a tremulous one when it is at rest. The fæces are elliptic. Occasionally the surface of the shell is eroded and pitted, so as to expose the innermost layers; or the top whorls are truncated. In the latter case a rude semispiral partition is formed by the upper fold of the mantle, as in *Truncatella truncatula.* The spire is now and then seen to be unnaturally lengthened, evidently owing to some accident in early growth, when a fresh start had to be made. The shell is extremely variable in size and comparative convexity. My largest specimen (from Southampton) is upwards of four lines long.

It is the *Bulimus anatinus* of Poiret, and *Turbo muriaticus* of Beudant, generically changed by Draparnaud and Lamarck to *Cyclostoma* and *Paludina.* Örsted described it as *Paludinella vulgaris.* I regard also the *Paludina balthica* of Nilsson and *P. minuta* of Requien as local varieties. The *Rissoa rubra* of Macgillivray is certainly the present species, and not *Barleeia rubra* as he supposed.

Family X. HETEROPHROSYNIDÆ, Clark.

Body spiral: *mantle* plain-edged: *head* snout-shaped: *tentacles* cylindrical and short, with rounded tips: *eyes* sessile, or nearly so: *foot* double-edged in front; hinder part of the sole slightly grooved down the middle.

Shell small, conical, and spiral: *operculum* not spiral but increasing by concentric layers, with the nucleus on the inner side, next to the pillar; that side is strengthened by a rib, and furnished underneath with a spike-like process or plate, which projects from the nucleus.

As the name imports, these mollusks are abnormal, allied to the *Littorinidæ,* and distinguishable from that family not much more than the *Turbinidæ* are from the *Trochidæ**. The operculum is very peculiar. It has an excentric nucleus, like that of *Buccinum,* and an internal process analogous to that of *Neritina.*

Although the appellation given by Mr. Clark is a long one, it must in justice and on other grounds be preferred to either of those subsequently proposed by Dr. Gray, viz. *Rissoellidæ* and *Barleeiadæ.* In the system of the latter author these families are separated by *Cuaplidæ* and several others.

The *Heterophrosynidæ* are not restricted to the Atlantic Ocean: Dr. P. Carpenter has described some from the Pacific. They inhabit the laminarian zone, and appear to be gregarious.

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* See vol. iii. p. 337.

Genus I. BARLEEIA*, Clark. Pl. I. f. 2.

Body stout: *snout* gibbous: *eyes* placed on small bulgings outside the tentacles, at their bases.

Shell solid and smooth: *mouth* oval, angulated above and below: *operculum* solid, ear-shaped, and gibbous, having the nucleus at the lower end of the inner side.

Differing from *Rissoa* not only in the structure of the operculum, but also in the mantle and opercular lobe of the animal in the present genus being destitute of filaments.

Barleeia rubra†, Montagu.

Turbo ruber, Mont. Test. Br. p. 320. *Rissoa rubra*, F. & H. iii. p. 120, pl. lxxviii. f. 4, 5.

Body yellowish-white, often transversely brindled with smokecoloured lines: *snout* projecting beyond the foot, cloven in front, fleshcolour or pink on the upper part: *tentacles* club-shaped, sparingly setose in some specimens and smooth in others, marked internally down the middle by a brownish line, or speckled with yellow: *eyes* rather large and black, scarcely raised, sometimes encircled by a bright sulphurcoloured line: *foot* lanceolate, short, rounded in front and behind; tail very slightly bifurcated: *opercular lobe* dark-purplish-brown.

Shell forming a short cone, remarkably strong, semitransparent, and glossy: *sculpture*, apparently none, but under a good magnifier consisting of a few indistinct spiral striæ: *colour* dark-red, claret, yellowish-brown, or tawny: *spire* bluntly pointed: *whorls* $5\frac{1}{2}$, compressed, gradually enlarging; the last occupies three-fifths of the spire: *suture* slight, having frequently a dark band below it on each whorl, caused by the double layer of shell in that part: *mouth* rather small: *outer lip* slightly incurved at the upper angle, thickened in full-grown specimens, and spread out at the base: *inner lip* reflected on the pillar, and united with the outer lip, but not so as to form a distinct peristome: *operculum* dark-crimson, composed of 5 or 6 irregularly concentric portions, the marks of division or growth being obscure; columellar side grooved near the margin, and having a corresponding rib underneath. L. 0·125. B. 0·6.

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* Named in honour of the late George Barlee, Esq., a zealous and indefatigable conchologist.

† Red.

Var. 1. *unifasciata.* Creamcolour or whitish, with a broad band of reddish-brown encircling each whorl, sometimes divided into two narrower zones. *Turbo unifasciatus*, Mont. Test. Br. p. 320; F. & H. pl. lxxx. f. 3.

Var. 2. *pallida.* White, with a faint tinge of blush colour.

HABITAT: Seaweeds at low water in the Channel Isles, and on many parts of the coasts of Dorset, Devon, and Cornwall; Cork (Wright and J. G. J.); Bantry (Barlee and Norman); Connemara (Barlee and Alcock); Bundoran, co. Donegal (J. G. J.). The following require confirmation:—Southampton (Montagu); Tenby (Lyons); Whitley, Northumberland (Fryer); Dublin Bay (Turton); Lamlash Bay, Bute (Landsborough); Dunbar (Laskey); Aberdeenshire (Macgillivray). Both varieties occur with specimens of the usual colour. The foreign localities are Cherbourg and adjacent coast (Macé); Rochelle (D'Orbigny père and J. G. J.); Biarritz (v. Martens, *fide* Troschel); Gulf of Lyons (Michaud and Martin); Nice (Vérany); Spezzia (J. G. J.); Corsica (Michaud, D'Orbigny père, and Requien); Dalmatia (Brusina); Sicily (Philippi); and Teneriffe (M'Andrew).

B. rubra is tolerably active. It occasionally secretes a slight mucous filament, by which it suspends itself from a seaweed or the surface of the water; and it also floats, with the foot uppermost, like the *Rissoæ*. The fæcal pellets are oval and whitish. The male is smaller than the female. I unfortunately misled the authors of the 'British Mollusca' by communicating the description which they published as that of the animal of the varity *unifasciata*; it was taken from *Hydrobia ulvæ* (as Mr. Clark suspected). The living shell of the present species is frequently encrusted by the common *Melobesia* or nullipore in its earlier stage of growth. The dark-crimson colour of the operculum offers a remarkable contrast to the white shell of the 2nd variety. In Professor Troschel's 'Gebiss der Schnecken' (vol. i. t. x. f. 8) the lingual riband is represented as nearly similar to that of *Rissoa parva*.

Turbo ruber of Adams (from the Pembrokeshire coast) appears to have been derived from a reddish specimen of *Rissoa parva*, var. *interrupta*. Our shell is *R. fulva* of Michaud, and *Sabanæa Binghamiana* of Leach.

Genus II. JEFFREYSIA*, Alder. Pl. I. f. 3.

Body slender: *snout* cloven so deeply that in some species the lobes thus formed resemble a second pair of tentacles: *eyes* placed behind the tentacles, on their inner side, either on small bulgings or sessile.

Shell thin, smooth, and glossy: *mouth* oval or roundish-oval, with a complete peristome: *operculum* rather thin, having the nucleus on the middle of the inner side, and a short rib on the under side, which proceeds from the nucleus in the direction of the outer margin.

The above characters show a greater departure from *Rissoa* than those of the last genus. According to Mr. Alder the lingual armature of *Jeffreysia* closely resembles that of the common *Rissoæ*; and indeed we find that the animals of both genera are vegetarians. Mrs. Collings detected in the stomach of *J. diaphana* a species of *Lythocystis* allied to *L. Allmani*.

Dr. Gray makes this synonymous with his undescribed genus *Rissoella*. The type indicated by him, in lieu of a description, is *Rissoa glabra* of Brown, which is evidently an *Odostomia* (probably *O. rissoides*), having "a slight plication at the base." In Gray's classified list of the Mollusca, published in 1847, *Rissoella* is given as a synonym of *Odostomia*.

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* A compliment paid to the author by his friend Mr. Joshua Alder.

1. Jeffreysia dia'phana*, Alder.

Rissoa? glabra (afterwards *R.? diaphana*), Ald. in Ann. N. H. xiii. p. 325. pl. 8. f. 1–4. *J. diaphana*, F. & H. iii. p. 152, pl. lxxvi. f. 1.

Body pale yellowish-white, faintly tinged with fleshcolour, and of a granular texture: *snout* expanding into two club-shaped lobes or processes, which diverge at the same angle as the tentacles, but are shorter and smaller: *tentacles* cylindrical, compressed (both the false and true tentacles are covered with vibratile cilia. Alder): *eyes* rather distinct than large, sessile and placed far back on the neck within the shell; each is encircled by a slight integument, so as to appear raised: *foot* lanceolate, somewhat bilobed in front, and angulated at each corner, rounded or bluntly pointed behind: *opercular lobe* mottled with brown, extending a little beyond the edges of the foot.

Shell forming a rather short and oblique cone, very thin, quite transparent, and of a somewhat iridescent lustre: *sculpture*, apparently none, but under a good magnifier consisting of delicate although obscure spiral striæ; the lines of growth are equally microscopical, but finer and more numerous: *colour* whitish: *spire* having a blunt and abrupt point: *whorls* 4½, convex, gradually enlarging; the last occupies three-fifths of the spire; first whorl rounded: *suture* deep: *mouth* rather large: *outer lip* sharp, incurved above, rounded and slightly expanded below: *inner lip* rather flexuous, its outline being accommodated to the curve of the pillar; behind it is a narrow umbilical chink: *operculum* yellowish-white, depressed in the centre, composed of 4 or 5 segments or layers, which are indistinctly defined, and closely striated in the same concentric direction; the inner side forms a very obtuse angle, the opposite side being rounded; spike triangular and flattened, having its narrower end at the base; medial rib short, diverging from the spike at a right angle; rib on the inner side marginal and slight. L. 0·075. B. 0·05.

Habitat: *Delesseria hypoglossum* and various other seaweeds, at low-water mark and a little beyond it, on many parts of our coast from Shetland to the Channel Isles inclusive. It was first noticed near Dublin and at Cullercoats by Mr. Alder. The only foreign localities of which I am aware are Cape Lévi near Cherbourg (Macé), and Spezzia (J. G. J.).

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* Transparent.

At the Whalsey Skerries *J. diaphana* occurs in company with its two congeners, *J. globularis* and *J. opalina*: the scale of their comparative frequency is the order here given, the last-named being the most numerous of the three. The present species is very active in crawling and floating; and it spins a slimy suspensile thread. When many specimens are left for some hours in a vessel of water, they congregate in small clusters, as if actuated by a social instinct. The spawn deposited by one individual consisted of only two ova, which were enclosed in a gelatinous hemispherical case. Owing to the extreme and glassy transparency of the shell, the dark reddish-brown liver is very conspicuous, even after the animal has dried up.

Perhaps this shell was the *Turbo nitidus* of Adams, from the Pembrokeshire coast, where it is not uncommon.

2. J. OPA'LINA*, Jeffreys.

Rissoa (?) *opalina*, Jeffr. in Ann. & Mag. N. H. ser. 2. ii. p. 351. *J. opalina*, F. & H. iii. p. 154, pl. lxxvi. f. 3, 4; iv. (app.) p. 267, pl. cxxxiii. f. 6, and (animal) pl. MM. f. 2, *a–b*.

BODY, above, dark-grey, mottled with purplish-brown or soot-colour; below, dirty yellow: *snout* short, rounded, seldom projecting beyond the foot; front edge finely scalloped: *tentacles* club-shaped, and of a paler colour [" very moderately setose," Clark]; they appear four in number, arranged in two pairs, each tentacle being nearly equal in length and thickness; the second or lower pair are scarcely part of the snout, because they issue from the neck, like the other pair: *eyes* sessile, rather close together, and surrounded by pale rings; they are visible only through the shell: *foot* large, triangular, bilobed, and slightly auricled in front, bluntly pointed behind.

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* Of an opal hue.

Shell oval, extremely thin, semitransparent, highly glossy and of an opaline lustre: *sculpture* as in the last species: *colour* bronze or dark horncolour when the shell is living or contains the remains of the animal, yellowish when it is empty: *spire* short, with an abrupt and blunt point: *whorls* 3½, swollen, rapidly enlarging; the last occupies at least three-fourths of the spire, and the first is mammiform: *suture* broad and deep: *mouth* oval, capacious, and more than half the length of the spire: *outer lip* sharp and thin, incurved above, slightly angulated and expanding below: *inner lip* flexuous and thickened on the lower part of the pillar, behind which it forms a narrow umbilical chink: *operculum* similar to that of *J. diaphana*; but the spike or apophysis is slightly curved, and occasionally double, so as to make two separate leaves. L. 0·1. B. 0·075.

Habitat: Guernsey and Sark, in rock-pools among *Corallina officinalis* (Barlee); Falmouth (Cocks and Barlee); Cumbrae, Clyde district (Norman); Skye (A. M'Nab); Whalsey Skerries, Shetland, on *Laminaria saccharina*, a little beyond low-water mark (J. G. J.). Although very local, it is abundant. I found a single specimen at Lerici; and Vérany has recorded this species from Nice.

At the Whalsey Skerries it especially frequents a sheltered part of the sound, close to a fish-curing station, where the offal is thrown out. The other species of *Jeffreysia* and *Trochus helicinus* are its companions. Do all these feed on decaying animal matter, or on Infusoria produced from it? The spawn is deposited on leaves of the *Laminaria*; it is of a semioval shape, with a large hole in the middle. When ripe it forms a thick mass, and contains an immense number of yellowish unispiral shells which are agglutinated together by a gelatinous matrix. The adult shell resembles *Hydrobia* *similis*; but it is not so turreted, and the spire has a blunt instead of a sharp point. A dead specimen from Falmouth is marked with flexuous and close-set longitudinal striæ, arising probably from a partial decay of the surface.

A comparison of the description of this species with that of *J. diaphana*, as regards their soft parts, may serve to show that the tentacles of all the Mollusca, whether univalve or bivalve, are nothing more than a development of the mantle, endued with special sensibility as organs of touch or of some other less direct medium of sensation. In some cases (e. g. *Chiton*, *Homalogyra*, certain species of the *Bulla* family, and inferior kinds of the naked Mollusca) tentacles are entirely wanting; while in others (*e. g.* the present species of *Jeffreysia*, and most of the Pulmonobranchiata) the usual pair becomes double, as if for the purpose of increasing the sense of perception. In *Pecten* and those bivalves which have the mantle open the tentacles are numerous; the cirri fringing the tubes of the majority of bivalves which have the mantle more or less closed appear to be supplementary organs of a similar nature; and so are the appendages of the head and opercular lobe in *Trochus*, *Rissoa*, and many univalves, as well as the cilia that cover the body in *Stilifer*. But I must not get out of my depth. We cannot all be physiologists,

> "And take upon us the mystery of things,
> As if we were God's spies."

3. J. GLOBULA'RIS*, Jeffreys.

J. globularis (Jeffreys. MS.), F. & H. iv. app. p. 268, pl. cxxxiii. f. 5.

BODY dark-grey, finely streaked with purplish-brown, paler underneath: *snout* forming two short cylindrical processes, which resemble tentacles but are close together: *tentacles* cylindrical, rather short, with blunt tips: *eyes* large, round, and sessile, placed far behind the tentacles: *foot* lanceolate, short, deeply cloven and bilobed in front, bluntly pointed or almost round behind.

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* Globular.

SHELL globosely conical (like that of *Valvata piscinalis*), extremely thin, transparent, highly glossy, and partially iridescent: *sculpture* the same as in the preceding two species: *colour* whitish when the shell is empty, dark horncolour when containing the animal or its dried remains: *spire* short and compressed; apex blunt: *whorls* 3½, very tumid, rapidly enlarging: the last occupies three-fourths of the spire: *suture* remarkably deep: *mouth* roundish-oval, somewhat detached, half the length of the spire: *outer lip* sharp and thin, considerably incurved above, slightly expanding and rounded below: *inner lip* separated from the pillar to a greater extent than in either of the other species, so as to make the peristome more distinct: *umbilicus* rather narrow but deep: *operculum* shorter and more oval compared with that of the other species; the marks of growth are also more conspicuous, and evidently show a concentric arrangement. L. 0·05. B. 0·065.

Monstr. Partly scalariform, in consequence of the suture being excavated and becoming much broader near the mouth.

HABITAT: On *Laminariæ* at Croulin Island, in Skye (Barlee), and, with *J. diaphana* and *J. opalina*, at the Whalsey Skerries (Barlee and J. G. J.); rather plentiful.

The tentacular processes of the snout in this species are much smaller and further apart than the true tentacles. In *J. opalina* the snout is very prominent, and quite distinct from the second pair of tentacles. In both species the hinder tentacles are usually borne at a right angle to the axis of the shell, and the other processes in front diverge at an angle of about 45°.

Family XI. SKENE'IDÆ, (*Skeneadæ*) Clark.

Body coiled in a circle: *head* large and snout-shaped: *tentacles* cylindrical in one genus, and wanting in another: *eyes* proportionally large, either almost sessile and placed at the outer bases of the tentacles, or quite sessile and placed behind the head: *foot* short: *opercular lobe* not furnished with any process or filament.

Shell minute, circular, with a wide umbilicus: *spire* much depressed, or even involute: *mouth* round, having united edges that form a complete peristome: *operculum* horny, circular, and spiral.

There is a seeming incongruity in the above description, with regard to the characters founded on the soft parts; but certain genera of *Bullidæ* are provided with tentacles, while others have none. The form of the shell in the present family exhibits a greater concordance than that of the animal. At all events some kind of classification is indispensable: as with heraldry, so with our science,

> "Order is Nature's beauty, and the way
> To order is by rules that Art hath framed."

The *Skeneidæ* are at present not much known, owing to their minute size. All the species hitherto described (three in number) inhabit the North Atlantic and Mediterranean; two are post-tertiary. In a recent or living state they are gregarious, and are sublittoral or frequent the higher part of the laminarian zone.

Genus I. SKE'NEA*, Fleming. Pl. I. f. 4.

Body depressed: *tentacles* cylindrical: *eyes* almost sessile, and placed at the outer bases of the tentacles.

Shell having the spire very little raised: *whorls* cylindrical:

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* Named after Dr. David Skene, a friend and correspondent of Solander.

mouth placed below the spire, and more or less detached from the body-whorl: *operculum* many-whorled, with a central nucleus.

Although the definition of this genus by its founder, Dr. Fleming, is extremely vague ("spire depressed, and destitute of spinous processes"), common usage has established it. It originally contained three so-called species, viz. *S. depressa*, *S. serpuloides*, and *S. divisa*. The first of these (or *S. planorbis*) is the type and sole representative; the other two are synonymous, and belong to the genus *Cyclostrema*. More species were afterwards added, but doubtfully, by Forbes and Hanley; these have now been assigned to what I consider their proper places. The tongue of *Skenea* is very much like that of *Rissoa*.

The present genus is partly *Delphinoidea* of Brown.

SKENEA PLANOR'BIS*, Fabricius.

Turbo planorbis, Fabr. Fn. Grœnl. p. 394. *S. planorbis*, F. & H. iii. p. 156, pl. lxxiv. f. 1–3, and (animal) pl. GG. f. 1 & 1*a*.

BODY greyish-white: *snout* rounded and gibbous; *tentacles* long and widely divergent; they are not, as in *Rissoa*, setose: *eyes* seated on broad and scarcely raised protuberances: *foot* truncated in front and rounded behind; sole marked down the middle of the posterior half with a slight groove or line.

SHELL resembling in shape a miniature *Helix ericetorum*, thin, opaque, and seldom glossy: *sculpture*, only a few slight and obscure puckers in the line of growth: *colour* reddish-brown, or pale tawny: *spire* scarcely visible, unless viewed edgewise or with the mouth of the shell towards the observer; apex blunt and rounded: *whorls* 4, rather loosely coiled; the last much larger in proportion to the others, and occupying at least three-fourths of the shell: *suture* deep: *mouth* projecting outwards, with a sharp and somewhat flexuous edge; *umbilicus* forming a wide, open, and rather deep funnel, usually exposing the interior of the spire: *operculum* clear-white, concave, with

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* Flat-coil.

7 or 8 obliquely striated turns, the last of which is proportionally much the largest; the under side has a small boss or nipple-shaped point in the centre. L. 0·03. B. 0·06.

Var. 1. *trochiformis.* Spire more prominent, and umbilicus consequently contracted.

Var. 2. *maculata.* Yellowish-white; the last whorl spirally ornamented by a double row of circular reddish-brown spots, one above and the other below the periphery.

Var. 3. *hyalina.* Clear-white and transparent.

HABITAT: Plentiful under stones and on seaweeds between tide-marks all round the coast. Var. 1. Shetland, Skye, and Lough Larne; this seems to bear the same relation to the common form as the *Helix rupestris* of Studer and Draparnaud does to the *H. umbilicata* of Montagu. Var. 2. Channel Isles. Var. 3. Skye and Channel Isles. Fossil: Clyde beds (Smith and Crosskey); Fort William (J. G. J.); post-glacial and glacial beds in Norway, 130–380 feet (Sars). Recent: Spitzbergen (Torell); Iceland (Steenstrup and Torell); Scandinavia (Lovén and others); north of France (Macé, Cailliaud and J. G. J.); Cannes (Macé); Nice (Vérany); Spezzia (J. G. J.); Madeira (Johnson, *fide* Hanley); Greenland (Fabricius and Möller); Massachusetts (Gould, as *S. serpuloides*); from Cape Cod northwards (Stimpson). Although it is a sublittoral species, Malm has dredged it in 10 f. on the Swedish coast, and M'Andrew in 15–40 f. on that of Upper Norway.

This little mollusk feeds upon *Lichina pygmæa* and small *Confervæ.* It swims with facility in an inverted posture, and occasionally suspends itself in the water by spinning a viscous thread with its foot. When crawling, the shell is carried sideways, not erect. Mediterranean specimens are frequently spotted, like our 2nd variety.

It is the *Helix depressa* of Montagu.

Genus II. HO'MALOGY'RA* (formerly *Omalogyra*), Jeffreys. Pl. I. f. 5.

Body flattened: *tentacles* wanting: *eyes* quite sessile, and placed behind the head.

Shell forming a flat coil, and having an involute spire: *whorls* more or less angulated: *mouth* clasping both sides of the periphery: *operculum* few-whorled, with a central nucleus.

The animal is unlike that of any known Pectinibranchiate mollusk; and, if we except *Omalaxis* or *Bifrontia*, the shell has no existing parallel among the marine univalves. In the latter respect it may be regarded as the analogue of *Planorbis*. The upper part of the body of *H. atomus* is partially ciliated. This character is exhibited to a greater extent in *Stilifer*, as well as in the tentacles of *Trochus, Rissoa, Cæcum*, and other genera. Dr. Fischer was rather too positive in stating (Journ. Conch. vii. p. 365) that my observations proved, "d'une manière irréfragable," the animal of the present genus to be the fry of some mollusk. The only instance adduced by him in support of such a conjecture is the change which many of the Nudibranchs undergo in the larval state. Their embryonic shells, however, have a rudimentary spire of scarcely a single whorl, and are all of the same size in each species, the animals are natatory, and the metamorphosis is of short duration. The shells of *Homalogyra*, on the contrary, have a complete spire of from 3 to 4 whorls, and are of various sizes (indicating different stages of growth); the animals crawl about, and they are met with at all seasons of the year. There is no more reason to suppose that *Homalogyra* is an immature mollusk than *Skenea, Cyclostrema*, or any other minute kind. The tongue of

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* A flat circle.

H. atomus, examined by Dr. Lukis and Mr. Alder, has only a single row of teeth (as in some of the Pleurobranchiata and sea-slugs), resembling miniature sharks' teeth. The snout or head-lobe and position of the eyes remind us of *Akera bullata.* Mr. Alder remarks that "the animal is altogether of very simple structure, and one of what Milne-Edwards calls degraded forms, occupying a similar position among the Testacea to what *Limapontia* does among the naked mollusks." I have placed it provisionally in the *Skenea* family.

I am still of opinion that this is a legitimate but diminutive descendant of the ancient genus *Euomphalus.* From a dislike to offend the prejudices of palæontologists, who treat the notion of reviving an "extinct" genus as a scientific heresy, I have substituted another name; but so notoriously imperfect is the geological record that we ought not to be surprised if the pedigree of *Euomphalus* cannot be traced down to the present time. *Homalogyra* is an upper tertiary fossil; and several species of flat-spired shells, which have been assigned to *Solarium,* occur in older formations, and may be the missing links of the genealogical chain. The description of *Euomphalus* in Sowerby's 'Mineral Conchology' (vol. i. p. 97) is as follows:—"An involute compressed univalve; spire depressed on the upper part, beneath concave or largely umbilicate. Aperture mostly angular." The tiny living representative of the great Trilobite family offers an analogy to the present case. Has all creation dwindled, and are these its last days? Brown's genus *Planaria* was founded on young specimens of *Planorbis spirorbis* and *P. albus,* which had been washed down by a freshwater stream into the sea. His genus *Spira* is characterized as "nearly globular or semiovate," and comprised the fry of some common species of *Rissoa*. In the 'Microdoride Mediterranea' of Costa (1861) the present genus is described under the name of *Ammonicerina*.

1. Homalogyra a'tomus *, Philippi.

Truncatella atomus, Phil. in Arch. f. Nat. (1841) vii. pt. 1. p. 54, t. v. f. 4. *Skenea nitidissima*, F. & H. iii. p. 158, pl. lxxiii. f. 7, 8.

Body yellowish-white on the upper side, and of a paler hue underneath, nearly hyaline: *snout* or head-veil short, broad, expansile and very flexible, forming in front two semicircular lobes; these lobes are sometimes separated by an intermediate membrane, which slightly projects, so as to make the extremity appear trilobed; the front part is usually, but not always, clothed with numerous irregularly disposed cilia of different lengths and sizes; when fully extended this part is so transparent that the foot can be seen through it: *tentacles* none, nor the slightest vestige of any, in whatever position or light the animal is viewed: *eyes* large in proportion, seated about halfway between the front edge of the shell and the extremity of the snout: *foot* lanceolate, slightly bilobed in front, and rounded or bluntly pointed behind: *opercular lobe* sometimes having on its upper margin a few cilia like those on the snout.

Shell resembling in shape a miniature *Planorbis corneus*, not very thin, semitransparent, and glossy: *sculpture*, usually fine and close-set indistinct striæ in the line of growth, but occasionally also some obscure ridges in the same direction on the first-formed whorls, and a few white varicose streaks on the body-whorl: *colour* reddish-brown or pale tawny: *spire* sunk below the level of the last whorl; apex blunt: *whorls* 3, compactly coiled, rounded on the upper side, and somewhat angulated or flattened on the under side; the last nearly enwraps all the rest, which are exceedingly small: *suture* deep: *mouth* projecting a little outwards, with a sharp and even edge; it is indented behind by the periphery: *umbilicus* wide, open, and almost flat, fully exposing the interior of the spire: *operculum* clear-white, flat, with 3 or 4 gradually increasing turns, which are defined by a thickened edge, and obliquely but slightly striated. L. 0·0125. B. 0·035.

Var. *vitrea*. Shell of a glassy transparency.

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* An atom.

Habitat: Abundant almost everywhere in the upper region of the laminarian zone, just beyond low water, on seaweeds and *Zostera marina.* I will mention a few localities to show the extent of distribution:—Shetland, Skye, all Ireland, Scarborough, Bristol Channel, Land's End, Torbay, and the Channel Isles. The variety was found in Loch Fyne by Mr. Barlee. This species is fossil in the Clyde district (Crosskey), near Fort William (J. G. J.), and in post-glacial beds, Norway, from the present sea-level to 100 feet above it (Sars). In a living or recent state it ranges abroad from Norway, in the laminarian zone (Sars) to Bohuslän, 10 f. (Malm), Cattegat (mus. Copenhagen), Etretat (J. G. J.), Cherbourg and Vallognes (Macé), Provence (Petit), Nice (Vérany), Corsica (D'Orbigny père), Sardinia (Costa), Spezzia and Sestri di Levante (J. G. J.), Sorrento (Philippi), to Lacalle in Algeria (Deshayes).

This little creature, on being captured and placed in a watch-glass with seawater, was at first shy; but when left for a short time undisturbed it crawled about freely and rapidly, like a snail, with its shell raised in a slanting position; and on its getting to the water's edge it turned upside down, and floated on the under surface. I observed it last year feeding on a *Conferva,* which it dragged into its mouth by means of its rake-like teeth. The snout was then contracted, and the rest of the body bunched up; the front appeared to be delicately scalloped or crenellated. The heart beat quickly, about 100 per minute; but the pulsation was intermittent. It afterwards retired into its house (perhaps to digest the meal), whence it seemed to reconnoitre me through the shell, with its dark eyes, like a porter from within the window of a hall. The shell is sometimes encrusted, on one side or the other, with Polyzoa and species of *Discorbina.*

Spawn-capsules which are occasionally found in the upper cavity of the last whorl in dried specimens, and which may be presumed to belong to the *Homalogyra*, are of a tawny colour and oval, with a wide slit or orifice at the top of each, and agglutinated together in a cluster of 5 or 6; they are much larger than the capsules that I have observed of any *Rissoa*.

Philippi must have made a mistake (an infirmity that is common to us all) in describing and figuring this mollusk as similar to the animal of *Truncatella truncatula*; and in the same work (Archiv für Naturgeschichte, vii. pt. i. p. 53, t. v. f. 7) *Assiminea litorina* is equally misrepresented. Instead of all these three species having the eyes seated on the inner base of the tentacles, one only (*T. truncatula*) can be said to be in this category. *H. atomus* has not the slightest appearance of tentacles; and in *A. litorina* the eyes are placed on their tips.

The present species was regarded by the authors of the 'British Mollusca' as Adams's *Helix nitidissima*. But that shell is evidently the fry of *Zonites radiatulus*, his *H. bicolor* being the fry of *Z. cellarius*. L. Pfeiffer referred our shell, with a doubt, to his genus *Paludinella*. It is the *Ammonicerina simplex* of Costa.

2. H. ROTA*, Forbes and Hanley.

Skenea rota, F. & H. iii. p. 160, pl. lxxiii. f. 10, and lxxxviii. f. 1, 2.

SHELL resembling in shape a miniature Ammonite (of the section *Capricorni*, De Buch), thin, semitransparent, and lustrous: *sculpture*, several ring-like ribs, from 20 to 25 on the last whorl of a full-grown specimen, besides 3 spiral keels (which vary in strength and are not always perceptible) and a few fine intermediate striæ; one of these keels encircles the periphery, and the other two the middle of each whorl on the upper and under sides; the ribs become slightly nodulous at the points where they are crossed by the keels, and they seldom extend on either side to the periphery: *colour* reddish-brown or pale-tawny, the keels being of a bright golden hue: *spire* not so much sunk below the level of the last whorl as in *H. atomus*: apex blunt: *whorls* 3, compactly coiled, somewhat compressed, with a slope from the peripheral keel in an equal degree on both sides: the last whorl is much larger than the next, but not so disproportionately large as in the other species: *suture* deep: *mouth* slightly expanding outwards, with a thin but even edge: it has somewhat of a horseshoe shape, with the rounded end in front, the indentation behind by the periphery being considerable: *umbilicus* wide, open, and nearly flat, completely exposing the interior of the spire: *operculum* clear-white, rather concave, and having 2 or 3 rapidly enlarging turns. L. 0·0115. B. 0·025.

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* A wheel.

HABITAT: In rock-pools among seaweed; a scarce species, although equally diffused with *H. atomus*. The following list of places where it has been found may be useful to collectors:—Lerwick, Skye, Bantry Bay, Cork, Scarborough, Sandwich, Isle of Wight, Weymouth, Falmouth, Tenby, and Manorbeer in Pembrokeshire, Oxwich and Caswell Bays near Swansea, and Guernsey (J. G. J.); Moray Firth (Gordon); "Landsborough's Bay" in Arran, N.B. (Norman); co. Donegal (Warren); Roundstone, co. Galway (Barlee and Alcock); Exmouth (Clark); Mousehole near Penzance (Templer); Land's End and other parts of Cornwall (Webster); Sark (Mrs. Collings). Its exotic range is less known; it comprises a sounding in N. lat. 55° 36′, W. long. 54° 33′, at the enormous depth of 1622 f. (Wallich), Bohuslän, in 10 f. (Malm), Gulf of Lyons (Martin), Spezzia (J. G. J.), Sardinia and the Mediterranean shores of Africa (Costa).

This is the smallest known species of British shells. It is an object

"Where unassisted sight no beauty sees."

You are shown what appears a minute speck of dust. Examine it under a microscope: the wheel of Aurora's chariot, with its refulgent spokes, must have been a piece of ordinary workmanship compared with this; its compactly convoluted shape, fine curved ribs, and encircling rings of gold call forth an admiration which, if expressed with regard to human feelings, might be termed doating; it unquestionably bears

> "The signature and stamp of power divine."

Mediterranean specimens of this and the last species are smaller than ours; that from Greenland is still larger. Clark fancied the present shell to be the spiral posterior terminal portion of *Cæcum trachea*; but that is a very different object. I believe Montagu was acquainted with *H. rota*, because in a letter of his to Mr. Dillwyn, dated 8th March 1814, he mentions the discovery of a very minute Ammonite-like shell. In the Turtonian collection it was named "Cornu Ammonis."

It is the *Skenea tricarinata* of Webster, and the *Ammonicerina pulchella* and (young) *A. paucicostata* of Costa.

Family XII. VERMETIDÆ, D'Orbigny.

Body tubular: *mantle* having a circular border, and closely fitting the neck: *head* snout-shaped: *tentacles* cylindrical: *eyes* sessile, at the bases of the tentacles, and placed more or less externally: *foot* short. Hermaphrodite?

Shell tubular, attached or free, usually (perhaps always) spiral or convoluted when young: *mouth* round: *operculum* horny, circular, and many-whorled, with a central nucleus.

I prefer following Clark, who placed in the present family the singular genus *Cæcum*, to arranging it among the *Turritellidæ* as proposed by Forbes and Hanley, or adopting Gray's name of *Cæcidæ*. The affinity of *Cæcum* to *Vermetus* is certainly very close, in respect not only of the animal, but also of the shell and operculum.

Genus CÆCUM*, Fleming. Pl. I. f. 6.

Body short.

Shell free, forming a curved and small cylinder, having in an early stage of growth a loose but regular coil of whorls, which afterwards falls off, the truncated extremity being then closed by a plug: *operculum* solid.

Costa would not believe the strange metamorphosis which the shell undergoes; but it is constant in every species. Such similitude in dissimilitude teaches us, as it did Charles Lamb,

> "That harmonies may be in things unlike."

From Professor Stimpson's account of *C. pulchellum* it would seem that a fresh truncation takes place during each of the last three stages of growth, when a separate plug or septum is formed. This genus is evidently allied to *Omalaxis* or *Bifrontia*, in the convolution of the spire and form of the operculum. Our knowledge of the animal is entirely derived from Mr. Clark's excellent observations. Mr. Alder says, as to the tongue of *C. trachea*, "the lateral spines, in two longitudinal rows, are slender and very numerous, with a minute plate in the centre." The 'Proceedings of the Zoological Society of London' for 1858 contain an elaborate monograph on the recent *Cæcidæ* by Dr. P. Carpenter. Fossil species occur in the Eocene and Pliocene strata of this country and Italy.

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* A blind gut.

In his 'History of British Animals' Fleming placed these shells in *Orthocera* (*Orthoceras,* a genus of fossil testaceous Cephalopoda), along with recent Foraminifera; and he thus drew on himself from Philippi perhaps the most severe reproof that could be administered to a naturalist, in the comment "horribile dictu." The censor himself classed them among the Pteropods! Montagu called the adult *Dentalium,* and the young *Vermiculum*; Brown gave the name of *Brochus* to the former, and *Cornuoides* to the latter. Other synonyms are *Odontina,* Zborzewsky, *Odontostoma,* Cantraine, *Odontidium,* Philippi, *Corniculina,* Münster, and *Dentaliopsis,* Clark. The fry constitute Costa's genus *Spirolidium.*

A. Solid and ringed; operculum flat.

1. CÆCUM TRACHE'A *, Montagu.

Dentalium Trachea, Mont. Test. Br. p. 497, t. 14. f. 10. *C. trachea,* F. & H. iii. p. 178, pl. lxix. f. 4, and (animal) pl. KK. f. 1, *a–c.*

BODY white, minutely grained, with two frosted, pale-yellowish-white contiguous raised lines on the upper part, forming a canal or groove, the points of which terminate anteriorly at the immediate base of the eyes, and posteriorly at the furthest end of the neck: *mantle* very thick and fleshy: *neck* slender, ridged lengthwise: *snout* long, flat, and cloven, with fine, close, contractile annular ridges; it is always in advance of the foot, and appears to assist in locomotion: *tentacles* frosted-white, rather long, divergent, at the extremities thickened, setose, and slightly clavate: *eyes* very minute and black; they "have decidedly an external bias" (relatively to the position of the tentacles): *foot* narrow, truncated in front when in action, sloping behind to an obtusely pointed or rather a rounded termination. (Clark.)

SHELL of nearly equal breadth throughout, solid, opaque, and somewhat glossy: *sculpture,* numerous fine, regular, and flattened concentric ring-like ribs, which are packed so closely as to allow very little space between them; they are sometimes arranged in joints or interrupted strangulations, denoting probably the limits of successive curtailment; under a microscope the entire surface (especially the interstices of the ribs) is seen to be marked lengthwise by excessively minute and crowded striæ: *colour* yellowish- or reddish-brown, occasionally variegated by circles of a darker hue: *spire* none in the adult, its place at the posterior extremity being closed by a solid shelly plug, which slopes from the ventral margin to a bluntly conical point on the opposite or dorsal side: *mouth* annular, slightly contracted, and strengthened by the last-formed rib: *operculum* brown or dark-horncolour, consisting of about a dozen gradually increasing whorls, defined by a narrow raised spiral line or suture; they become less distinct towards the centre, which is concave. L. 0·125. B. 0·033.

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* From its being marked with rings like a windpipe; the Latin word is properly *trachia.*

Habitat: Rather common in the coralline zone of Dorset, Devon, and Cornwall; Sandwich (Walker); Guernsey (Barlee); Swansea, Tenby, and Barmouth (J. G. J.); Bantry Bay (Thompson and J. G. J.); Arran Isle, co. Galway (Barlee); Clyde district (Norman and Robertson). I do not consider it a British fossil; for I believe the shells described and figured by Searles Wood from the Coralline Crag are not this species, but his *C. mammillatum*. Philippi, however, has given it as a Sicilian fossil, under the name of *Odontidium rugulosum*; and Professor Hörnes includes it in his great work on the Miocene formation near Vienna. It inhabits the coast of Brittany, beyond low-water mark of spring-tides, according to Cailliaud; M'Andrew dredged it in 8 f. at Vigo; and several authors have noticed it as Mediterranean (both on the European and African coasts) and Adriatic; on sponges from the Archipelago (Bean); Canary Isles, 50 f. (M'Andrew); Cuba (Philippi).

Clark informs us that the animal is not at all shy, and that all the specimens which he examined had an ovary. He expressed some doubt whether the branchial apparatus consists of two plumes or one only. Young shells are more convex and tapering, and their mouth is bell-shaped. The fry is exceedingly curious. It is long and twisted, not unlike the horn of an antelope; its posterior termination is formed of a minute coil of two whorls. The concentric ridges are then perceptible towards the mouth only, and are very slight; the rest of the shell is quite smooth and glossy. I am indebted to the Marquis James Doria for baby specimens which he dredged at Spezzia.

This is the *Dentalium imperforatum* of Adams 'On the Microscope' (from Walker's figure), as well as of Montagu who described the young as *D. trachea*; but the latter specific name is now generally used. Brown called it *Brochus striatus* and *B. trachiformis*; Cailliaud spelt the name *C. trachœa*. The fry is Costa's *Spirolidium Mediterraneum*.

Brochus annulatus and (young) *B. reticulatus* of Brown ("Loch Strangford") is an exotic species. Dr. P. Carpenter found no less than 53 specimens of it by washing the common sponge of commerce from the West Indies; and Mr. Bean has some from Aden. I mention this because *C. annulatum* has been noticed and figured in the 'British Mollusca' on the authority of a specimen received by Mr. Alder from Mr. Clark. Fleming's description of his *Orthocera trachea* (Br. An. p. 237) evidently applies to the same foreign species.

B. Thin and smooth; operculum convex. *Brochina*, Gray.

2. C. GLABRUM*, Montagu.

Dentalium glabrum, Mont. Test. Br. p. 497. *C. glabrum*, F. & H. iii. p. 181, pl. lxix. f. 5.

BODY pure-white, with the lines forming the canal or groove on the neck less conspicuous than in the other species: *foot* carried much more laterally. It is similar in other respects, taking into account the difference of size and greater delicacy of the present species. (Clark.)

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* Smooth.

SHELL of nearly equal breadth throughout, not quite so much curved as in *C. trachea*, rather thin, transparent, and glossy: *sculpture*, none except under the microscope, which exhibits a slightly frosted appearance: *colour* clear-white: *spire* replaced by a rounded but not very convex shelly plug: *mouth* annular, thickened at its edge: *operculum* resembling an inverted tea-cup without a handle, yellowish-brown, and consisting of about 10 regularly increasing whorls, 6 of which are raised, one above another (like circular steps), and are defined by a narrow spiral ridge; they are distinct on the crown or centre, which is depressed. L. 0·075. B. 0·0135.

HABITAT: All our coasts, from Shetland to Guernsey, in the coralline zone; common. Fossil in the Coralline Crag at Sutton (S. Wood); Norway, in newer or post-glacial deposits, 50–80 feet (Sars). Living in Norway (Lilljeborg); Mangerfiord, near Bergen, in 10–50 f. (Sars); Bohuslän, 10 f. (Malm); Danish coast (mus. Copenhagen); Brittany (Macé and Cailliaud); Provence (Forest, Martin, and Macé); Nice (Vérany); Spezzia (Doria and J. G. J.); Canary Isles, 12–50 f. (M'Andrew).

"I thought the *Cæcum trachea* very active, but it is far surpassed by this animal; I put one of each in a watch-glass of sea-water, and with a camel's-hair brush gave them a fair start, but the little one beat its competitor hollow, and accomplished a space of 2 inches in 55 seconds; thus affording a proof, even in the Mollusca, that Nature compensates for the small volume of the minute beings in giving them greater energy, vivacity, and quickness." (Clark.) Half-grown shells are more slender and curved, with a proportionally wider mouth. The spire of the fry has two whorls—the inner one being sometimes broken off, so as to make the centre pervious.

This species may possibly have been the *Dentalium minutum* of Linné, from Plancus. It is the *Odontostoma lævissima* of Cantraine; and it is the *Brochus glabrus* and *B. lævis* of Brown, the young being his *B. arcuatus*, and the fry his *Cornuoides major* and *C. minor*. Adams ('On the Microscope') named the last-mentioned state of growth *Serpula incurvata*; and Montagu called it (from another of Walker's figures, showing the centre whorl broken off) *Vermiculum pervium*. Sars does not believe the *S. incurvata* of Adams can be the young of *C. glabrum*, because he has found specimens of each equally large; but it must be borne in mind that the adult are of different sizes, and that many species of mollusca have a dwarf or small variety. Besides, when the spire is truncated and gone, the shell becomes proportionally shorter, although it increases in diameter.

Family XIII. TURRITELLIDÆ, Clark.

Body elongated: *mantle* forming a slight canal or fold in front: *head* snout-shaped: *tentacles* cylindrical: *eyes* outside the tentacles, at their base: *foot* short: *gills* consisting of a single plume. Hermaphrodite?

Shell spiral and turreted, many-whorled, not umbilicate: *spire* tapering, with a blunt apex: *mouth* having a thin and flexuous outer lip: *operculum* horny and circular.

The founder of this family afterwards sacrificed it by uniting it with *Vermetidæ*. Most conchologists, however, think they ought to be separate. The *Turritellidæ*, in all probability, subsist on animal food.

Genus TURRITEL'LA*, Lamarck. Pl. II. f. 1.

Body cylindrical: *mantle* fringed at its edge: *snout* short, contractile: *tentacles* separated by the snout: *eyes* placed on slight prominences: *opercular lobe* entire.

Shell pyramidal, spirally ridged or striated: *spire* having the top whorls, when disused, partitioned off by a solid hemispherical plug: *mouth* round, or inclining to square: *operculum* rather solid, with numerous whorls, the outermost of which overlap one another, or are imbricated, and all are finely puckered in an oblique direction; nucleus central.

Old English naturalists called these shells "screws." They are not, like their human namesakes, confined to the civilized part of the globe, but are met with everywhere, in great variety. The species are numerous and prolific, inhabiting the coralline and deep-sea zones. In a fossil state they have been found in formations certainly as far back as the Greensand. Our common species is either very shy or very sluggish; it rarely shows more than its foot and the tips of its tentacles. I have been obliged to deprive it of the greater part of its shell in order to examine the soft parts. The lingual membrane is minute: each row of teeth consists of a broad central plate or rhachis, flanked on either side by three narrow and incurved pleuræ.

Turritella has several obsolete synonyms.

Turritella te'rebra †, Linné.

Turbo terebra, Linn. S. N. p. 1239. *Turritella communis*, F. & H. iii. p. 172, pl. lxxxix. f. 1–3, and (animal) pl. II. f. 4.

Body yellowish, mottled with brown and speckled with white: *mantle* thick, fringed on its outer and inner edges with fine filaments [arranged in a triple row, and reflected (Lovén)]: *snout* broad, depressed, bilobed towards the extremity, which is delicately scalloped round the margin [tuberculated at the edge (Lovén)]: *tentacles* conical, pointed, slender, and variable in length: *eyes* small, on bulbs or offsets at the outer base of the tentacles: *foot* lanceolate, dilated and rounded in front, bluntly angulated and abruptly terminating behind [" grooved below " (F. & H.); sole marked on its hinder portion with a depressed line down the centre (Clark)].

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* A diminutive from *turris*, a tower.

† A borer.

SHELL forming a slender and elongated pyramid, with a more or less narrow base which is somewhat angulated; it is solid, opaque, and of a dull hue: *sculpture*, rather sharp spiral ridges, of which there are 3 on each of the upper whorls, and double that number on the last whorl, besides several intermediate and smaller ribs on the lower whorls, and sometimes also on the upper ones; the whole surface is covered with fine and close-set indistinct flexuous striæ in the line of growth: *colour* yellowish-brown of various shades, with occasionally darker longitudinal streaks: *spire* sharply pointed, although the tip is usually broken off: *whorls* 16–20, convex but compressed, shelving above and below the suture; they increase very gradually: *suture* distinct, becoming deeper towards the base of the spire: *mouth* squarish, angulated above and slightly expanding below: *outer lip* incurved on the upper side: *inner lip* reflected over the pillar, and in adult specimens united with the outer lip: *operculum* dark-horncolour with a tawny coating, composed of about 30 imbricated turns, which are invested with minute and delicate tuberculated threads arranged obliquely and sometimes projecting beyond the margin so as to make it appear spinous; the centre is slightly concave. L. 2·25. B. 0·65.

Var. 1. *nivea*. Snowy-white.

Var. 2. *gracilis*. Narrower and more slender.

HABITAT: Sand and mud in 3–100 f., throughout our seas; gregarious. The 1st variety is not uncommon on the west coast of Scotland and in Shetland, mixed with coloured specimens: I have also dredged it at Exmouth. The 2nd variety is local, and occasionally white; it has been taken at Torquay with the ordinary kind by Mr. Alder, in Shetland by Mr. M'Andrew and others, in Cork Harbour by Mr. Humphreys, and in Bantry Bay by myself. The latter variety also occurs on the coasts of Spain and Portugal, and in the Mediterranean. If it had not been for an intermediate form which Mr. Barlee obtained near the Arran Isles in the west of Ireland, I should have been inclined to consider this variety a distinct species. Deshayes refers it to the *T. cornea* of Lamarck; but the description, "point de stries," is surely inapplicable to our shell. Plate 449 of the 'Encyclopédie Méthodique,' cited by Lamarck, represents likewise a smooth shell. *T. terebra* abounds in almost every newer tertiary and quaternary deposit here and abroad, occasionally at great heights, as on Moel Tryfaen; of which we have accounts from many a conchologist

> "And him that vexed his brain, and theories built
> Of gossamer upon the brittle winds,
> Perplexed exceedingly why shells were found
> Upon the mountain-tops, but wondering not
> Why shells were found at all, more wondrous still!"

It inhabits a considerable part of the European seas, from the Loffoden Isles to the Ægean and the African shores of the Mediterranean, at depths varying from 5 to 100 f.

The "Auger" of Pennant. It sometimes attains the length of 3 inches. In aged specimens the outer lip is very thick, being formed of numerous layers. The whorls are sometimes flattened, or scalariform.

This common species was described and figured as English by Lister, whom Linné quotes for it in the 'Fauna Suecica;' and that work is cited in his 'Systema Naturæ,' where *Turbo terebra* was first named, with "Habitat in O. Europæo." No such references are given in Linné's description of *Turbo ungulinus*, which may therefore have been exotic. Our shell was called by Risso not only *Turritella communis*, but *T. striatula* and by many other names. It is the *T. Linnæi* of Deshayes: the fry was probably Adams's *Turbo strigatus*.

Turbo duplicatus of Linné, as well as his *T. imbricatus* and *T. exoletus* (the last being *T. cinctus* of Da Costa) are tropical species of *Turritella*; they were erroneously introduced by Lister, Leach, Da Costa, and Montagu into the list of British shells.

Two arctic species of the present or an allied genus occur in our glacial formation, viz.:—*T. polaris* of Beck = *T. erosa*, Couthouy, at Bridlington (Woodward), and Elie in Fife (Rev. Thomas Brown, *fide* Geikie); and *T. reticulata* of Mighels and Adams = *T. lactea*, Möller, at King Edward in Aberdeenshire (Jamieson). The former of these has also been found in a fossil state by Mr. Searles Wood in the Coralline Crag at Sutton, and by Principal Dawson in Canada.

Family XIV. TRUNCATEL'LIDÆ, Gray.

BODY elongated: *mantle* plain-edged: *head* forming a cylindrical, contractile, and bilobed snout: *tentacles* conical, separated by the snout: *eyes* sessile, or nearly so, placed a little above (rather than outside) the bases of the tentacles: *foot* short, and rounded at each end: *gills* consisting of a single plume.

SHELL cylindrical: *spire* truncated on the animal arriving at maturity, the opening thus made being filled up with a fresh layer of shell: *mouth* oval, with a complete peristome: *operculum* horny, ear-shaped, with a very short spire, having its nucleus on the columellar or inner side of the mouth, near the base of the shell.

There is a great gulf between this family and the *Turritellidæ*. Perhaps it is owing to a fault in the system of classification—our motto being "*nil deest nisi clavis*" (as in the mysterious frontispiece that represents the *Domus Naturæ* in 'Ripley revived,' by Eirenæus Philalethes); or perhaps the intermediate space is occupied by exotic and fossil forms. At any rate I can place the *Truncatellidæ* nowhere else. The European seas have only a single generic and specific representative, which appears not to be found north of the English Channel.

Genus TRUNCATEL'LA *, Risso. Pl. II. f. 2.

Generic characters those of the family.

The habits of these mollusks are littoral. They live chiefly on the brink of high-water mark, under stones and decaying sea-weeds, which are periodically covered by the sea; and in this sense they may be termed amphibious. Considerable doubt has been entertained by many naturalists whether *Truncatella* is marine or terrestrial, and whether it is furnished with gills like *Littorina*, or with an air-pouch like *Melampus*. The careful and long-continued experiments made by the Rev. R. T. Lowe, which were published in the 5th volume of the 'Zoological Journal,' seem to prove that it is truly marine, one of his specimens having lived 14 weeks constantly immersed in sea-water; and Mr. Clark has given us full particulars of the branchial apparatus.

Lowe proposed at one time to call this genus *Erpetometra* (from its peculiar mode of creeping); Christophori and Jan have given it the name of *Choristoma*, Leach those of *Zeanoë*, *Glaucothoë*, and (according to Gray) *Truncatula*; the young constitutes the genus *Fidelis* of Risso.

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* Diminutive from *truncatus*, cut off.

TRUNCATELLA TRUNCA'TULA *, Draparnaud.

Cyclostoma truncatulum, Drap. Tabl. Moll. p. 115. *T. Montagui*, F. & H. iii. p. 317, pl. xcix. f. 1, and (animal) pl. FF. f. 10.

BODY very pale yellowish-white, with grey specks: *snout* long, narrow, and very extensile, annulated when at rest, auricled at each end; it is finely grooved down the middle: *tentacles* short, broad, flat, and somewhat triangular: *eyes* black, with white pupils, on expansions of the tentacles: *foot* roundish-oval and thick.

SHELL forming a short and turreted cylinder, nearly equal in breadth throughout; it is rather thin, semitransparent, and glossy: *sculpture* sometimes none, in other specimens more or less distinct and strong longitudinal ribs on all or part of the whorls; under a good magnifier may also be detected faint traces of spiral and close-set striæ: *colour* pale yellowish-brown or tawny, with a creamy tint: *spire* having an extremely blunt tip in the young, and abruptly truncated in the adult; the line of fracture where the first-formed whorls were rubbed off is conspicuous: *whorls* 6½ in the young, and 3½ only in the adult; although rounded they are compressed, especially in the middle of each, and increase very gradually, the penultimate whorl being in fact a trifle broader than the last; the original whorls are fragile, and (like the milk-teeth of certain Mammalia) deciduous at the proper season: *suture* deep: *mouth* small in comparison with the size of the last whorl; it is somewhat contracted above, rounded and expanded below: *outer lip* reflected, and not very thin: *inner lip* thickened in full-grown specimens, and a little detached from the pillar; there is no chink behind it, much less an umbilicus: *operculum* thin, yellowish, marked with slight flexuous striæ in the line of growth. L. 0·175. B. 0·06.

HABITAT: Muddy shores near high-water mark, under stones, at Southampton, and at Salcombe, Plymouth, and in other parts of South Devon (Montagu); Weymouth (Bryer and others); Poole (Maton and Rackett); Newhaven (J. G. J.); Guernsey (Lukis). It is rather plentiful in the backwater behind Portland Island.

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* Having a small truncation.

Laskey says that he dredged it off Dunbar, Fleming that he found a specimen in the cavity of a dead *Spatangus purpureus* from the Firth of Forth, Macgillivray that it has been taken in sea-sand from Cruden in the Moray Firth, and Thompson that Mrs. Hancock obtained a young shell of this species at Bundoran in co. Donegal; Bean enumerates it in his list of Scarborough shells. I suspect that there has been some mistake as to the specimens from all these last five places. A large West-Indian species (*T. succinea,* C. B. Adams) has been often mistaken for ours. Philippi records the present species as fossil in Sicily; and I found specimens in a quaternary or more recent deposit near Martigues in the Département of Bouches-du-Rhône. It inhabits the Atlantic shores of France, both sides of the Mediterranean, as well as the Adriatic and Ægean seas; and M'Andrew has noticed it at Malaga and Lancerote.

It creeps slowly, in the fashion of a caterpillar. The action of the foot is thus described by Clark:—"on the march maintaining posteally and anteally the oval contour, with a vermicular motion, like an advance of one half to the other; this action gives an apparent crease, simulating an incised transverse line, but on the step being completed, the foot becomes entire." I could not detect any pulsation: the gill-pouch was transparent, and appeared to be filled with air. The shell varies considerably in bulk. Possibly the smooth kind, which is smaller than the other, may be the male, and the ribbed kind the female; the transition from one kind to the other, however, is very gradual.

Helix subcylindrica of Linné may be this species; but "Habitat in aquis dulcibus Europæ borealis" makes it rather doubtful. Montagu called the adult shell *Turbo truncatus,* and the young *T. subtruncatus;* Risso distinguished the smooth and ribbed forms as *Truncatella lævigata* and *T. costulata,* and the young as *Fidelis Theresa.* The last appears to be the *T. Desnoyersii* of Payraudeau. Lowe gave this species the name of *T. Montagui,* his *T. truncatula* from Madeira being different. The young is Macgillivray's *Eulima nitidissima.* According to Philippi our shell is *Cyclostoma concinnum* of Scacchi, and the young is *Paludina strigilata* of Pareyss. The corresponding name for each state of growth bestowed by Leach on this polyonomatous shell are *Zeanoë nitida* and *Glaucothoë Montaguana.* Draparnaud, in his 'Tableau des Mollusques,' expressed his belief that his *Cyclostoma truncatulum* ought to constitute a distinct genus, an opinion of which Risso unskilfully availed himself.

Family XV. SCALARI'IDÆ, (*Scalaridæ*) Broderip.

Genus SCALA'RIA *, Lamarck. Pl. II. f. 3.

Body screw-shaped: *mantle* plain-edged, forming an incipient or slight fold at the base of the shell: *head* short, snout-shaped, furnished with a cylindrical and retractile proboscis: *tentacles* awl-shaped, with blunt tips: *eyes* on short stalks, at the outer bases of the tentacles: *foot* lanceolate, double-edged in front; sole grooved down the middle: *gills* consisting of a single plume. Sexes separate.

Shell turreted, longitudinally ridged or plaited, and often also transversely striated: *spire* elongated and pointed; apex slightly inflected: *mouth* nearly round, with a complete and thickened peristome, angulated below: *operculum* horny, ear-shaped, few-whorled, and having the nucleus on the columellar or inner side of the mouth but not far from its centre.

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* From *scala*, a ladder.

In this family and genus occurs for the first time a *retractile* proboscis or "haustellum," instead of a *contractile* snout or "rostrum." Mörch* suggests that there may be no greater difference between these two organs than between a long and a short siphon. The armature of the tongue is very simple, and consists of a single row of uniform teeth on each side without any in the middle; it agrees nearly with that of *Homalogyra* and the *Bulla* tribe. Without presuming to disparage the labours of those conchologists who may be termed odontological systematists, I think an undue importance has been given to this character as a basis of classification for the Gastropoda. The alimentary and masticating organs of all animals depend on the nature of their food; and every division of the Gastropoda contains some kinds which are phytophagous and others which are sarcophagous or zoophagous. *Scalaria* belongs to the latter class. According to Dr. Gould, a specimen of *S. Grœnlandica* which Mr. Couthouy kept alive for the purpose of examination "fed eagerly upon fresh beef, especially if somewhat macerated." The animal of every species of *Scalaria* emits a purple dye, like *Planorbis corneus, Ianthina,* and *Aplysia.* The use of this secretion is not sufficiently known†. Montagu made some curious experiments with the dye of *S. communis,* showing that the colour is changed by the application of mineral acids, and that it is not affected by cream of tartar, nor materially by either volatile or fixed alkali; that it is not diminished by putrefaction, nor fixable by any then known astringent; it resisted for some months the action of the air and sun; but being exposed for a whole summer to the solar rays in a south aspect, it almost vanished. Ever since the cultivation of conchology (in the limited sense of the word and not as a science), the true "wentletrap" or "windeltreppe" has been regarded as an object of especial admiration for its graceful shape and exquisite sculpture; it fetched at one time as high a price as some of the rarest cones and cowries, which (in my opinion) it far excels in beauty. Lamarck states that the ridges which adorn the shell are marks of growth, each forming in succession the border of the mouth. This is probably the case, if we consider them marks of periodical rather than annual growth: a full-grown *S. communis* has about 100 of these ridges, and we can hardly suppose that it lives as many years. The number of varices or stronger ridges, distributed at intervals and observable in *S. Turtonæ* and other species, may indicate the age. *Scalariæ* inhabit every sea, although frequenting more the Indian Ocean. About 200 species have been described, recent and fossil. We are told by Nyst that many of the latter occur in the cretaceous and tertiary formations; one has been recorded from the Coral Rag, and another as Silurian.

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* Ann. & Mag. N. H. 3rd ser. xvi. p. 397.

† See vol. i. (Introduction) pp. xxxv and xxxvi.

Among the synonyms are *Scala* of Klein (pre-Linnean), *Scalarus* of Montfort, and *Clathrus* of Oken.

1. SCALARIA TUR'TONÆ*, (*Turtonis*) Turton.

Turbo Turtonis, Turt. Conch. Dict. p. 208, f. 97. *S. Turtonis*, F. & H. iii. p. 204, pl. lxx. f. 1, 2.

BODY dark-coloured: *proboscis* long: *eyes* placed on prominent tubercles: *foot* white behind and underneath, folded in front when withdrawn into the shell. (Bivona, *fide* Philippi).

SHELL slender, solid, opaque, somewhat glossy: *sculpture*, slightly curved, flattened, and more or less imbricated longitudinal ridges, 12 being on the last whorl, 11 on the penultimate, and 10 on the next, after which they diminish in number; these ridges are broader and foliaceous at the top of each whorl; they are not continuous throughout the spire, but are usually disposed in alternate order, and some of them, at irregular intervals, are double or multiple, so as to form broad and strong varices; the interstices of the ribs are finely and closely striated in a spiral direction: *colour* light yellowish-brown, with 3 purplish-brown or coffeecoloured bands on the body-whorl and 2 on each of the other whorls; of the 3 bands the upper two are above the periphery and sometimes confluent, the third (which is generally broader) encircling the base: *spire* tapering gradually to a fine point: *whorls* 15–16, rounded, although compressed, and increasing very gradually: *suture* well defined, but not deep: *mouth* more round than oval, angulated above, and much more so below: *outer lip* encircled or strengthened by the last-formed ridge, having a slight sinus near the upper part, and somewhat reflected: *inner lip* broad, extremely thick at the base and lower angle of the mouth; there is no umbilicus behind it: *operculum* dark-horncolour, having about 6 turns, rather concave, and strongly striated in the line of growth; it resembles that of a *Littorina*, but the nucleus is more central. L. 1·75. B. 0·5.

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* Named after a daughter of Dr. Turton.

HABITAT: Coralline zone in Guernsey (Lukis); Devon and Cornwall (Turton and others); Tenby (J. G. J.); Laugharne, Carmarthenshire (Barlee, and Lindsay); estuary of the Mersey (Collingwood); Scarborough (Bean and Leckenby); Aberdeen (Macgillivray); Clyde district (Forbes and others); co. Down (Thompson); Dublin Bay (Turton and others); south of Ireland (Ball and others); co. Galway (Barlee). It is by no means common. Dr. Turton states that "in many parts of Ireland, but especially about Balbriggan, they are found crawling among the rocks"! In a fossil state this species has been recorded from the Belfast deposit by Hyndman and Grainger, under the name of *S. Trevelyana*; Ireland, Ayr, and Bute (Smith); Nice (Risso); Sicily (Philippi). It inhabits the North Atlantic from

Bergen (Lovén and others) to Madeira (M'Andrew), and every part of the Mediterranean, Adriatic, and Ægean, at depths ranging between 5 and 45 f.

Several specimens having the operculum were in Mr. Clark's collection, from Exmouth: I wish he had given us an account of the animal. Young shells have the base somewhat angulated.

It was possibly the *Turbo ambiguus* of Linné, described as inhabiting the Mediterranean, and very like *T. clathrus* (but fleshcolour, with 3 reddish-brown bands, and having twice as many ribs); this, however, is said to be umbilicate, a character that belongs to none of the European species. Risso appears to have given our shell the specific names of *Turtonia* and (as fossil) *elegans*, Michaud that of *tenuicosta*, Bivona *planicosta*, Scacchi *plicata*, Broun *alternicosta*, and Leach *Turtoniana*.

2. S. COMMU'NIS*, Lamarck.

S. communis, Lam. An. s. Vert. vi. (2) p. 228; F. & H. iii. p. 206, pl. lxx. f. 9, 10.

BODY milk-white, irregularly streaked with black or mottled with dark-purple on the upper part: *mantle* thick, tight about the neck, its margin forming a round collar: *snout* vertically cloven in the centre, whence the proboscis (which is white) frequently protrudes as if in search of food: *tentacles* long and slender [black, Alder]: *eyes* on the inner side of small bulbs or excrescences [white spaces, Alder], which rise from the outer bases of the tentacles: *foot*, when fully extended, long and narrow, somewhat angulated and notched or bilobed in front, with a very slight rounded auricle at each corner, and tapering behind to a point; it is often carried far beyond the head; sole marked in the middle from one end to the other with a groove or impressed line. [Male organ long, bent, and pointed, of a dusky hue (Clark).]

SHELL more conical than the last species, solid, opaque, and of rather a dull hue: *sculpture*, slightly curved longitudinal ridges, which are reflected or folded backwards, but not flattened as in *S. Turtonæ*; there are 9 on the last whorl, 10 on the penultimate, and 8 on the next, diminishing in number towards the apex; the ridges are somewhat broader at the top of each whorl, and cemented to those in the preceding whorl, so as to make the series continuous in an oblique direction; they do not (unless very rarely) form varices, nor is one larger than any of the others except in the course of growth; under a good magnifying-power their interstices are seen to be sometimes marked with a few extremely slight and indistinct spiral striæ, and occasionally also with delicate and close-set longitudinal striæ or impressed lines, which latter especially cover the ridges; the first 3 or 4 whorls are quite smooth: *colour* varying from cream to fawn, with frequently (as in *S. Turtonæ*) 3 purplish-brown or coffeecoloured bands on the body-whorl, and 2 on each of the other whorls; these bands, however, are not continuous, but broken and divided into short streaks; sometimes the shell is beautifully mottled all over with purplish-brown, although retaining the lowest band; apex light-brown: *spire* rather abruptly tapering to an apparently fine point; apex flattened, slightly reversed or inflected, but not so decidedly as in the genus *Aclis*: *whorls* 15–16, convex, gradually enlarging: *suture* deep: *mouth* more round than oval, more or less angulated above and below: *outer lip* encircled and strengthened by the last-formed ridge, somewhat reflected: *inner lip* broad, extremely thick at the base and lower angle of the mouth; no umbilicus: *operculum* dark-horncolour, having about 6 turns, concave in the middle, and marked with coarse flexuous striæ in the line of growth. L. 1·5. B. 0·6.

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* Common.

HABITAT: English, Bristol, and St. George's Channels; all the coasts of Ireland; Kent (Montagu and others); Dogger bank (Rich); Scarborough (Leckenby); Leith (Da Costa); Dunbar (Laskey); Clyde district (Hennedy and others). It is usually an inhabitant of the coralline zone; but Mr. Sturges-Dodd found living specimens at very low tides in Pontac Bay, Jersey. Estuarine deposit at Selsea, Sussex (Godwin-Austen); Ireland (Smith); post-glacial bed in Norway, 50 feet (Sars); North Italian tertiaries (Brocchi); Sicily (Philippi). Its foreign range, as recent, extends from Finmark (Lilljeborg) to the Canary Isles (M'Andrew) in the North Atlantic, as well as throughout the Mediterranean, Adriatic, and Ægean. The depths given by different authors vary from 8–40 f.; and Mr. M'Andrew found this species alive on the shore at Vigo and Gibraltar.

Montagu says that the purple dye issues from a gland behind the head: the great beauty of its colour was first noticed by Plancus in Mediterranean specimens. The shell is the "small stair-case" of Petiver, "bastaard wenteltrapje" of the Dutch according to Klein, "barred wreath" of Pennant, and "false wentletrap" of Da Costa, the "true wentletrap" being *S. scalaris* or *pretiosa*. Our shell barely exceeds 2 inches in length.

It is the *Turbo clathrus* of the 10th and previous editions of the 'Systema Naturæ,' as well as of the 'Fauna Suecica;' but the species so named in the 12th edition of the 'Systema' is described as having the base encircled by a spiral keel or ridge, and is consequently not the British species. Da Costa called it *Strombiformis clathratus*, apparently from a habit, in which he indulged with a most inconvenient pertinacity, of substituting new names for old; the latter specific name, not having been adopted by any subsequent writer, must be considered obsolete. Gmelin and Mohr evidently mistook the *Turbo clathrus* of Linné for his *T. clathratus*, which is a *Trophon*.

3. S. Trevelya'na*, Leach.

S. Trevelyana, (Leach, M.S.) Winch, on the Geology of Lindisfarn, Ann. Phil. new ser. iv. p. 434; F. & H. iii. p. 213, pl. lxx. f. 7, 8, and (animal) pl. FF. f. 1–3.

Body yellowish-grey or pale-fawncolour, with a faint tinge of purple, minutely streaked and speckled with white: *snout* broad and semicylindrical, slightly cloven in the middle, and delicately stippled with brown: *tentacles* gradually tapering, although rather short, margined on each side with a purplish-brown line, and streaked with white underneath: *eyes* small, round, and black, immersed in bulgings at the outer bases of the tentacles: *foot* very long and slender, extending far beyond the head, in front somewhat rounded and with small angular corners, bilobed behind; on the upper side a long furrow runs from the hinder edge of the operculum to the tail, as in *Trochus*, with a well-defined ridge on each side of it.

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* Named in honour of the discoverer, Miss Emma Trevelyan.

Shell conical and of about the same proportions as *S. communis*, much thinner than that or the preceding species, opaque, somewhat glossy: *sculpture*, longitudinal ridges, arranged usually in continuous but oblique rows, as in *S. communis*; they are, however, narrower, less folded, and more flattened, and are occasionally varicose; the upper part of each ridge is broader and generally (especially towards the point of the spire) expands into a short spur-like projection, so as to give a turreted appearance to the shell; there are 14 ridges on each of the last two whorls, 13 on the next, diminishing in number upwards; the interstices of the ridges are delicately and microscopically striated in a spiral direction; the first 4 or 5 whorls are smooth and polished: *colour* fawn; the ridges are white: *spire* tapering to an apparently fine point; apex as in the last species: *whorls* 14–15, convex, increasing gradually: *suture* deep: *mouth* considerably more angulated below than above, the pillar being somewhat strait, especially in the young: *outer lip* thick, formed of the last ridge: *inner lip* rather thin above, and less connected than usual with the outer lip, thickened and broad below; behind it is a depression, but no umbilicus: *operculum* light-horncolour, having about 6 turns, the inner ones being defined by a slightly raised edge; it is concave in the middle, and marked with coarse flexuous striæ in the line of growth. L. 1. B. 0·4.

Habitat: Shetland, in 75–100 f. (M'Andrew and others); Orkneys, 15–100 f. (Thomas); Moray Firth (Gordon); Firth of Forth (Gerard); northern coasts of England, from Berwick to Scarborough (Johnston and others); Macgilligan, co. Londonderry (Thompson); co. Cork (Humphreys and Wright); off Mizen Head and Cape Clear in 50–60 f., and on the Nymph bank in 50–55 f. (M'Andrew); Arran I., co. Galway (Barlee); Tenby (Lyons); Laugharne, Carmarthenshire (Lindsay); Plymouth (Jordan); Hayle (Miss Hockin); 15 miles from the Land's End in 50 f. (M'Andrew, *fide* Forbes). Norwich Crag (Wigham, Thomas, and Woodward); Red Crag (S. Wood). It has been dredged off Christiansund in 60 f. by Danielssen, and in 40–50 f. by Sars, in Christianiafiord by Asbjörnsen, off Bohuslän by Lovén, and in 40–80 f. by Malm, and in the Kattegat, with *Crania anomala*, by the last-named writer; Tiberi procured it in an immature state from coral-fishers at Naples.

The animal is extremely shy; it takes alarm and shuts itself up, even when you touch the table on which the vessel containing it stands. Like its congeners it emits a purple dye. The denticles of the tongue are slender and curved. The shell may be distinguished from that of *S. Turtonæ* by its smaller size, greater delicacy of texture, finer and more numerous ribs (each of which is generally furnished on the upper part with a short spur), and by its pretty fawn- or fleshcolour variegated by white ribs. My largest specimen is not much more than 1⅛ inch long. Some are more elongated than others; those from Ireland have a broader base and faint traces of bands, disposed as in the preceding two species, but of the same colour as the body of the shell, although of a somewhat darker hue. Distortions occur in which the spire is more or less bent; and one has a distinct but narrow umbilicus.

This species was first described by Dr. Johnston, in the Proceedings of the Berwickshire Naturalists' Club for 1841. In Thorpe's (or Hanley's) 'British Marine Conchology' the specific name is spelt *Treveliana*. *S. frondicula* of Searles Wood, from the English and

Belgian Crag formations, is closely allied to it, if not the same shell.

4. S. CLATHRA'TULA*, Adams.

Turbo clathratulus, Ad. Micr. t. 14. f. 19. *S. clathratula*, F. & H. iii. p. 209, pl. lxx. f. 3, 4.

BODY clear-white, with a very faint dusky tinge on the upper part, and thickly interspersed with minute opaque-white flakes: *mantle* fleshy, even with the mouth of the shell: *snout* very short, compressed and crescent-shaped: *proboscis* long and strong, frequently protruded: *tentacles* of moderate length, and divergent: *eyes* very black, placed not on offsets, but on scarcely raised eminences at the outer bases of the tentacles, of which they form part: *foot* often carried considerably in advance of the head and tentacles; it is short, narrow, in front nearly semicircular and with a minute auricle at each corner, and tapers gradually behind to a slender rounded termination; hinder half of the sole deeply grooved in the middle lengthwise, with a depression in the centre. (Clark and Alder.)

SHELL elegantly pyramidal, rather thin, semitransparent, and glossy: *sculpture*, fine, sharp, laminar, erect, and curved longitudinal ridges, set rather obliquely, either in a continuous or alternate order; each is nearly of the same height and size throughout, and very seldom are any of them varicose; there are 18 on each of the last two whorls, and 16 or 17 on the next, diminishing in number upwards; their interstices are spirally but indistinctly and irregularly striated, as in the other species, and on the upper part of the body-whorl some fine longitudinal striæ may occasionally be observed; the first 3 or 4 whorls are smooth and polished: *colour* uniform, snow-white: *spire* finely tapering; apex like that of the other species: *whorls* 12–13, convex, gradually enlarging: *suture* deep: *mouth* inclining to oval, decidedly angulated below: *outer lip* incurved above, and slightly expanding: *inner lip* reflected, especially at the base: *operculum* yellowish-brown, having from 4 to 5 turns, concave in the middle, and marked with strong flexuous striæ in the line of growth. L. 0·6. B. 0·02.

HABITAT: Sparingly distributed throughout all our seas, from the Shetland to the Channel Isles. It properly belongs to the coralline zone; but Mr. Clark found a living specimen "in the middle of the littoral district, at the roots of the *Corallina officinalis*, at Exmouth." Mr. Humphreys took a dead one from the stomach of a Red Gurnard at Cork. Fossil in the Coralline Crag, Sutton (S. Wood); Belgian Crag (Nyst). Professor Hörnes has described and figured a miocene species, from the Vienna basin, under the name of *S. clathratula*, supposing it to be our species; I regard them as distinct. The only foreign locality known to me, north of Great Britain, is Bohuslän, where Malm dredged it in 70 f. It inhabits the coasts of France, Spain, Portugal, Italy, and Algeria, at depths ranging from 4 to 36 f.

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* Small-barred: diminutive of *clathrata*, from the Linnean specific name *clathrus*.

"This creature is very free in showing its peculiarities" (Clark). He noticed the usual purpuriferous vein behind the neck. According to him the operculum is white: in a specimen from his collection the colour of that appendage is yellowish-brown. The shell is a most graceful object.

It appears to be the *Turbo lamellosus* of Delle Chiaje, *S. pulchella* of Bivona, and *S. Georgetina* of Kiener.

Mr. M'Andrew dredged two fragments of *S. Grœnlandica* in 38 f. off Duncansby Head in the north of Scotland. Although these fragments have every appearance of being recent, I must request the reader to bear in mind the remarks which I made in the Introduction to vol. i. (pp. xciv–xcvi) with respect to the difficulty of distinguishing fossil from recent shells procured under similar circumstances. Not more than 30 miles below Duncansby Head Mr. Robert Dawson traced a newer tertiary deposit of great extent, containing *Pecten Islandicus* and other arctic species. *S. Grœnlandica* is not uncommon in the high northern seas of both hemispheres, its southern limit in Europe being Bergen. It occurs in the glacial or post-glacial beds of Aberdeenshire (Jamieson), at Bridlington (Forbes), as well as in the Norwich and Red Crag. The shell has remarkably strong and conspicuous spiral striæ between the ridges, and its base is encircled by a keel.

I have a specimen of *S. pseudoscalaris*, Brocchi, which the late Miss Lavars of Penzance picked up in Porthcurnow cove near the Land's End, together with *S. Turtonæ*, *S. communis*, and *S. clathratula*. Its nearest ally is *S. communis*, from which it may be known by the more conical shape, sharper ridges, and basal keel or ridge. This species may be British; for Taslé has recorded it from Morbihan, and Aucapitaine and Fisher from the Charente-Inférieure.

Acirsa borealis of Beck has been dredged in 18–20 f. off the coast of Antrim by Mr. Hyndman, Mr. Waller, and myself, and on the Aberdeenshire coast, from 3 to 8 miles from land, in 30–45 f., by Mr. Dawson. This species has not been found living south of Iceland. It is the *S. Eschrichti* of Holböll (*fide* Möller), and *Turritella Hibernica* of Waller. Mörch's genus *Acirsa* seems to connect the present family with the next.

Family XVI. PYRAMIDELLIDÆ, Gray.

Body spirally twisted: *head* furnished with a long cylindrical and retractile proboscis; flap ("mentum" of Lovén) extensile, but rarely projecting beyond the foot: *tentacles* conical or triangular, flattened, and smooth, with more or less inflated tips: *eyes* sessile at the inner base of the tentacles, and placed near to each other: *foot* lanceolate, and double-edged in front. Branchial apparatus consisting of a single gill-plume. Tongue unarmed or toothless.

SHELL small, conical or pyramidal, smooth or variously sculptured: *spire* pointed, with an inflected and mostly a reversed apex: *mouth* oval, somewhat angulated but not channelled below: *outer lip* thin: *operculum* ear-shaped, with a short imperfect spire of very few whorls; nucleus excentric, on the inner side near the base.

This family contains several genera, some of which (especially *Odostomia*) abound in prolific species. They are widely diffused over the present marine area of our globe, and appear to have had an equally extensive range in periods which we call geological. The *Pyramidellidæ* inhabit all the zones, and are probably sarcophagous, not zoophagous or predaceous. Their shells are graceful in shape, and often beautifully sculptured; but, being minute, they can be appreciated by those only who have accustomed themselves to see

> "Form in things which to the eye
> Half-read is but deformity—
> Grandeur in mean things and small,
> And God's great handiwork in all!"

Although it does not appear that any direct observations have been made as to the reproductive system of the *Pyramidellidæ,* it may be inferred from an unpublished drawing by Möller of the soft parts and operculum of *Monoptygma albulum* (*Turbo albulus,* Fabricius), which is allied to *Aclis* and belongs to the present family, that the sexes are distinct. In that drawing (for a tracing of which I am indebted to Dr. Mörch) the male organ is very conspicuous.

Genus I. ACLIS*, Lovén. Pl. II. f. 4.

BODY slender: *tentacles* long, approximating at their bases: *eyes* placed rather more on the outer than the inner base of the tentacles.

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* A small javelin.

Shell elongated: *mouth* slightly expanded, and having a more or less complete peristome: *pillar* never furnished with any fold or tooth.

Perhaps this is an ill-assorted genus. More information is desirable to clear up some doubts as to the organization of its component species.

Leach's genus *Alvania*, adopted by Searles Wood, subsequently to Lovén's publication, for *Aclis supranitida*, comprised (according to Risso, who first described that genus on Leach's authority) only certain species of *Rissoa*. In Leach's own work the type of *Alvania* is *R. striata*.

1. Aclis u'nica*, Montagu.

Turbo unicus, Mont. Test. Br. p. 299, t. 12. f. 2. *A. unica*, F. & H. iii. p. 222, pl. xc. f. 4, 5.

Body clear-white, with very minute and close-set flaky specks: *mantle* furnished with a cylindrical filament (as in *Rissoa*) at the upper angle of the mouth of the shell: "*muzzle* slender and rather long, having the first half from the neck, on its upper part, clothed with a very close tunic or tight overlay; the disk is smooth, compressed, bevelled to a fine edge, and almost circular, with a median vertical fissure on the under surface, in which I have often seen the delicate white corneous plates, jaws, and lingual riband:" *tentacles* moderately long, flat, rounded or obtuse at the tips, quite smooth even under high magnifying powers, and divergent: *eyes* large and black, not on peduncles or prominences, but fixed each on the centre of the base of either tentacle, with very little external inclination, and widely apart; on the march the eyes are usually carried within the margin of the shell: *foot* slender, greatly hollowed out in front, and deeply labiated, having distinct, long, arched linear auricles which play or vibrate when the animal is crawling, beneath [behind?] which it is slightly constricted; it terminates in a rounded, rather broad point; no median line is apparent in any part of the sole: *opercular lobe* simple. (Clark.)

Shell needle-shaped, thin, semitransparent, somewhat glossy: *sculpture*, numerous delicate and flexuous longitudinal ribs, crossed by as many fine spiral ridges or striæ, and producing by their mutual intersection an exquisitely reticulated appearance; the ribs are usually stronger on the upper whorls; apex smooth and polished: *colour* white, with a faint tinge of yellowish-brown in live or fresh specimens: *spire* elegantly tapering to a blunt point, which when viewed sideways appears button-shaped, and projects a little beyond the succeeding part of the spire; if viewed from above it appears slightly inflected: *whorls* 9–10, moderately convex, and gradually increasing; the first whorl and half of the next form the apex of the spire: *suture* deep, rather oblique: *mouth* exactly oval, effuse below: *outer lip* slightly flexuous, incurved above: *inner lip* thin, adhering to the pillar, connected with the outer lip at the upper corner; there is no umbilicus, but the base is narrowly depressed behind the pillar [: *operculum* "light yellow and suboval, with distinct grossly spiral turns" (Clark)]. L. 0·115. B. 0·02.

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* Unparalleled.

HABITAT: Local in the littoral zone. I will enumerate some of the places where this species has been noticed:—Haroldswick Bay in Unst (Dawson); Moray Firth (Murray, *fide* Gordon); Hebrides (J. G. J.); Dunbar (Bingham, *fide* Brown); Lamlash (Landsborough); Northumberland and Durham (Alder); Scarborough (Bean and J. G. J.); Dublin Bay (Turton); Cork (J. G. J.); Sandwich (Walker and J. G. J.); Barmouth, Tenby, and coast of Gower (J. G. J.); Cornwall and Devon (Montagu and others); Guernsey (Barlee and J. G. J.). Mr. Clark found the living specimen from which his description was taken in Littleham cove near Exmouth, at low-water mark, on the margin of a deep and quiet rock-pool, among débris of small decayed shells mixed with sand and mud that had an offensive odour. Loire-Inférieure (Cailliaud); Spezzia (J. G. J.).

"This creature is not at all shy; it remained lively for thirty-six hours, and gave every facility for good examination; it readily creeps up the deepest glasses, and, however often brushed down, starts again with unabated vigour" (Clark).

It is the *Turbo albidus* of Adams's work on the Microscope (from Walker's figure), and *Turritella Clealandiana* of Leach. The latter writer was of opinion that "unicus is a very improper name for a species." Surely no shell has a better claim than the present to be considered alone of its kind, or unparalleled, which is the the meaning of the name. It once belonged to the genus *Turbo*, afterwards to *Turritella*, then to *Chemnitzia* (or *Odostomia*), since to *Aclis*, and it was last transferred to *Rissoa*. Our dainty Ariel has long served many masters, and perhaps it is time that he should have his liberty. Should such an emancipation take place, and a new genus be required for the distinction of this unique species, *Graphis* might be a suitable name.

2. A. AS'CARIS*, Turton.

Turbo ascaris, Turt. Conch. Dict. p. 217. *A. ascaris*, F. & H. iii. p. 219, pl. lxxxviii. f. 8.

SHELL forming an elongated and slender cone, rather solid for its size, semitransparent, and somewhat glossy: *sculpture*, strong spiral ridges, of which there are 5 on the body-whorl, and three or four on each of the other whorls; the uppermost ridge on each whorl is placed at some little distance from the suture; the base of the shell is smooth; some slight and flexuous longitudinal striæ or wrinkles may be detected by using a Coddington lens: *colour* milk-white: *spire* tapering to apparently a fine point: *whorls* 8–9, convex in the middle, but compressed or sloping on the upper part of each towards the suture; they enlarge rather suddenly: *suture* deep and rather oblique: *mouth* exactly oval, effuse below: *outer lip* slightly flexuous, incurved above, more or less thickened near the edge, so as occasionally to form a varix in an earlier stage of growth: *inner lip* somewhat thickened and adhering to the pillar, reflected near the base; it is imperfectly connected with the outer lip at the upper corner; behind it is a small and narrow umbilical chink. L. 0·1. B. 0·025.

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* A tapeworm.

Habitat: East Shetland, 82 f. (M'Andrew); Aberdeenshire (Dawson); west coast of Scotland (Barlee); Scarborough (Bean); Barmouth, Tenby, and Plymouth (J. G. J.); Burrow Island (Beevor); Exmouth (Barlee); Bude (Lindsay); Guernsey (Lukis, Barlee, and J. G. J.); Dublin Bay (Warren and Alder); Bundoran (Mrs. Hancock, *fide* Thompson); Arran Isle, co. Galway (Barlee); Seafield, in the west of Ireland (Turton). Coralline Crag, Sutton, with *A. supranitida* (coll. Wood in mus. Brit.). Bergen (coll. Lovén in mus. Stockh.), and in 70 f. (Lilljeborg); Quinéville, near Cherbourg (Macé); Loire-Inférieure (Cailliaud).

It appears to be the *Pyramis acutissimus* of Brown, "found on Belton sands, near Dunbar, by General Bingham."

3. A. SUPRANI'TIDA*, S. Wood.

Alvania supranitida, S. Wood, Cat. Crag Moll. *Aclis supranitida*, F. & H. iii. p. 320, pl. xc. f. 2, 3.

Body slender ["entirely white" (Hanley)]: *head* not beaked [not snout-shaped]: *proboscis* long, strong, and retractile: *tentacles* cylindrical, slender, somewhat inflated at the top, close together at the base ["subulate and truncated" (Hanley)]: *eyes* immersed at the base of the tentacles, and placed rather laterally ["placed far back, sessile, and rather distant" (Hanley)]: *foot* having the "mentum" [or upper edge] somewhat detached, narrower than the sole, and extended ["tail simple and obtuse" (Hanley)]: *opercular lobe* ample, of a different shape on each side, being on the right larger and forming 3 or 4 folds, on the left produced into a single rounded lobe which is folded behind; sole tongue-shaped, truncated in front: tongue unarmed? (Lovén.)

Shell ten times greater in bulk than *A. ascaris*, and otherwise differing from that species in not being so slender, and in having a much broader base; it is distinctly and deeply umbilicate in every stage of growth; sometimes there are 5 ridges on each whorl, at other times 3 only on the body-whorl and 2 on each of the other whorls, occasionally none on the body-whorl and 2 or 3 on each of the upper ones, or else there are no ridges at all and the whole surface is quite smooth and glossy; the suture is more deeply excavated, and nearly straight; this species has 12 whorls, and the mouth is more round than oval. L. 0·25. B. 0·1.

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* Exceedingly glossy.

HABITAT: Occasionally procured by dredging and trawling, as well as by examining drifted shell-sand, Aberdeenshire and the Hebrides (Dawson), Aberdeen (Macgillivray), Blackpool (Kenyon), Belfast (Hyndman and Waller), Dublin Bay (J. G. J.), Bantry Bay (Miss Hutchings, *fide* Leach, and Hanley), Barmouth (J. G. J.), Tenby (Lyons and J. G. J.), Langland Bay near Swansea (J. G. J.), Bude (Lindsay), Land's End (Hockin), Falmouth (Cranch, *fide* Leach, and Hockin), Plymouth (Prideaux, *fide* Leach, and J. G. J.), Hastings (Leach), and Guernsey (Hanley, Lukis, and J. G. J.). Coralline Crag (S. Wood). Bohuslän (Lovén and Lilljeborg, and, in 12 f., Malm); Cattegat, 10–20 f. (Malm); Brittany (Taslé and Cailliaud); Vigo Bay, 8 f., and Madeira (M'Andrew); Gulf of Lyons (Martin); Algeria (Weinkauff).

This shell is Brown's *Turritella minor*, the type of which I examined in the collection of the late Mr. Lyons at Tenby; but I certainly should not have recognized it by the description. That gives the length as $\frac{3}{8}$ of an inch, and the breadth "not an inch." The specific name *minor* is obsolete and very incorrect. It is apparently the *Turritella nivea* and *T. nitida* of Leach, and perhaps also his *Alvania glabra* (according to Wood), and *Alvania albella*. Weinkàuff described the present species in the 'Journal de Conchyliologie' for 1862 as the *Turritella umbilicata* of Dunker.

4. A. WALLE'RI*, Jeffreys.

SHELL forming an elongated cone, very thin, transparent, and lustrous: *sculpture*, none to the naked eye or with a low magnifying power, but under a Coddington lens may be detected a few faint and obscure spiral raised lines and very fine flexuous marks of growth: *colour* white: *spire* tapering to a blunt point, which is unmistakeably introverted: *whorls* 10, rather convex in the middle, with a slope above and below: *suture* deep and nearly straight: *mouth* roundish-oval, considerably dilated at the base: *outer lip* flexuous, prominent, and somewhat expanding: *inner lip* nearly straight, and reflected at the base, apparently wanting on the upper part of the pillar, and therefore separate from the outer lip: *umbilicus* small but distinct: *operculum* filmy, wrinkled in the line of growth, composed of three turns, the last and outermost of which is disproportionately large; the line of division between these whorls is raised or ledge-like. L. 0·135. B. 0·05.

HABITAT: East Shetland, 40–45 miles off the Whalsey Skerries, in 78 f., one live and three dead specimens. Coralline Crag, Sutton (coll. S. Wood in mus. Brit.), a single specimen, mixed with *A. ascaris*. Lilljeborg has dredged the present species off Molde in Norway, at a depth of 70 f.; and I found a specimen among some small shells procured by Dr. Wallich in 1622 f.†, about 100 miles N.E. of Hamilton's Inlet, Labrador.

All that I could see of the animal in the living Shetland specimen were two black eyes, which were visible through the shell, as in *Jeffreysia* and *Eulima*; it appeared to be in a dying or collapsed state. The abysmal specimen from North America is much larger than any of those from the European seas and the Coralline Crag. The shell is distinguishable from *A. supranitida* by being of a much smaller size (intermediate between that of the latter species and of *A. ascaris*), thinner and of a more delicate texture, and exquisitely polished, having the whorls less convex, the outer lip more expanded, and the pillar-lip nearly straight and spread out at the base, and in the umbilicus being contracted.

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* Named in honour of Edward Waller, Esq., of Aughnacloy, co. Tyrone, an assiduous and good British conchologist. Perhaps the specific name ought, classically, to be *Valleri*.

† See vol. ii. pp. ix and x of the Introduction.

5. A. Gulso′næ*, Clark.

Chemnitzia Gulsonæ, Clark in Ann. & Mag. N. H. 3rd ser. vi. p. 459.
Odostomia Gulsonæ, F. & H. iv. (app.) p. 281, pl. cxxxii. f. 6.

Body flake-white, with a faint tinge of yellow: *mantle* even with the shell: *neck* very long, cylindrical (like that of *Odostomia spiralis*), and finely wrinkled across; the vertical fissure of the mouth lies under the tentacular membrane: *tentacles* thick, broad, short, not very membranous, rounded at the tips, each of which has a minute flake-white lobe or inflation; they are united by an intermediate membrane: *eyes* black, not very near together, immersed close to the base of the tentacles, on minute white circles; they do not in the least invade the area of the neck, but rather infringe on the tentacles: *foot* exceedingly short, narrow, deeply bifurcated in front, rounded behind when at rest, and a little lengthened in action; the front edge (or mentum) is long, slender, grooved at the margin in front and on each side, the upper and lower surfaces being entire: *opercular lobe* plain: *liver* light green: *ovary* very pale red, and granular: *branchial plume* narrow and curved, consisting of about 15–18 rather coarse, opaque, pale drab strands: *heart* and *auricle* intense snow-white. (Clark.)

Shell slender, rather cylindrical than conical, very thin, transparent, and lustrous: *sculpture*, none: *colour* clear white: *spire* gradually tapering to a blunt and nearly globular point, which is decidedly introverted but not sinistral: *whorls* 6–7, convex: *suture* deep, rather oblique: *mouth* roundish-oval, having the outer base somewhat truncated and deeply sinuated or almost notched: *outer lip* remarkably flexuous, prominent, and expanding: *inner* (or pillar) *lip* short, nearly straight, and slightly reflected near the base, not united with the outer lip; behind it is a slight depression and narrow chink, but no umbilicus [: *operculum* "an almost invisible film, pear-shaped or suboval, with a narrow border of pale bistre with a pinkish hue; the striæ of increment radiate as in most of the other *Chemnitziæ*" (Clark)]. L. 0·065. B. 0·025.

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* Named out of compliment to Mrs. Gulson, a lady at Exmouth, to encourage her inclination for natural history.

Var. *tenuicula*. Comparatively diminutive, and more slender.

HABITAT: Coralline zone in Shetland and Skye (Barlee and J. G. J.); off Larne, co. Antrim (Hyndman and J. G. J.); Falmouth (Barlee and Hockin); Helford (Hockin); Fowey (Barlee); Exmouth (Clark and Barlee); Weymouth and Sandwich (J. G. J.); and Guernsey (Barlee and J. G. J.). The variety, which may be the male, is from Lamlash Bay (Bean); L. Strangford (Waller); Land's End (Hockin); and Guernsey (J. G. J.). *A. Gulsonæ* has been found by Mr. S. Wood in the Coralline Crag at Clacton, and dredged in Vigo Bay by Mr. M'Andrew. It is rare.

Mr. Clark noticed that the animal seldom protrudes its eyes and tentacles. He mentions "a rudimental denticle on the pillar-lip." I have minutely examined more than 20 specimens, but could not detect any such process.

This and *A. unica* are aberrant forms of *Aclis*. Each has peculiar characters, which render their systematic allocation very difficult. Having suggested another generic name for *A. unica*, in the event of its being considered necessary to separate it from the present genus, I would also venture in the like contingency to propose the generic name of *Menippe* for *A. Gulsonæ*.

Genus II. ODOSTO'MIA *, Fleming. Pl. II. f. 5.

BODY usually slender: *mantle* plain-edged, somewhat folded on the right, so as to form a slight canal: *snout* (or head-flap) projecting beyond the foot: *proboscis* long, issuing from a slit just below the space in front between the tentacles; it is only evolved when feeding: *tentacles* triangular and folded inwards (not unlike an ass's ears), united at their base by an intermediate membrane; tips bulbous and ciliated: *eyes* immersed in the skin or outer integument, and placed on the neck a little behind the tentacles.

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* Mouth of the shell furnished with a tooth; per syncopen for *Odontostomia*.

Shell forming a cone of various lengths: *spire* having the first or top whorls sinistral and turned backwards: *mouth* expanding at the base: *inner lip* very rarely united with the outer lip: *pillar* usually straight and furnished in the middle with a single tooth or plait: *operculum* semitestaceous, having a thin flap on the outer side and a short apophysis or process underneath the nucleus of the spire.

The name and limits of this peculiar genus have been the subject of much controversy.

The history of its name is as follows. In the Supplement to the 4th, 5th, and 6th editions of the 'Encyclopædia Britannica' (published at intervals between 1818 and 1824) will be found the article "Conchology," by Dr. Fleming. The genus *Odostomia* is there described as consisting of certain species of marine shells, placed by British writers in the genus *Turbo*, in which the columella is furnished with a tooth. "The *Turbo interstincta, unidentata, plicata, Sandivicensis,* and *insculpta* of Montagu are of this genus." This article was separately republished, with plates, in 1837. Fleming's 'Philosophy of Zoology' (1822) enumerates *Odostomia* as one of the genera of the "marine *Turbonidæ*;" and it is therefore most probable that the number of the Encyclopædia which contained the article "Conchology" had then appeared. In 1862 Risso (Hist. Nat. l'Eur. mér. iv. p. 224) formed the genus *Turbonilla*, on the MS. authority of Leach, for three fossil species; all are described as longitudinally ribbed, and one of them furnished with a fold. In Turton's 'Enumeration of Marine Shells found on the Devonshire coast' (1829) *Odontostoma* was proposed by him as the generic name, and is thus characterized: "Shell conic oval; pillar with a single tooth or fold towards the middle; operculum none. Includes *Turbo unidentatus* and others." This description, in respect of the absence of an operculum, is obviously wrong. Fleming's 'History of British Animals' (1828) gave a more correct definition of the present genus. The 7th volume of the 'Edinburgh Encyclopædia' (1830), under the head "Conchology," has full descriptions of the genus *Odostomia* and of the above-named species of Montagu; but *Pupa* and other land-shells are by some mistake confounded with them. Alcide D'Orbigny's account of the Mollusca, in the Supplement to Barker-Webb and Berthelot's Natural History of the Canary Isles (1839 or 1840), gives *Chemnitzia* as a subgenus of *Melania*; it is inadequately defined, the animal being described as "inconnu," and the shell as intermediate between *Eulima* and *Bonellia* or *Niso*. The *Turbo elegantissimus* of Montagu (*T. lacteus*, L.) is the sole type of D'Orbigny's subgenus. Much more precise and accurate, however, was the definition by the Rev. R. T. Lowe, in the 'Proceedings of the Zoological Society' for 1840, of his genus *Parthenia*, which corresponds with *Chemnitzia*. Three more synonyms are *Pyrgiscus*, Philippi (Wiegmann's Archiv, 1841), *Orthostelis*, Aradas and Maggiore (Atti Accad. Gioenia, 1841), and *Loxonema*, Phillips (Palæoz. Foss. Cornwall, 1841); to which may be added, in part, *Jaminia* of Brown (not of Leach or Risso), *Turbonella* of Leach, and for certain species *Eulimella* of Forbes, and *Auriculina* of Gray. Clark proposed, but never published, the significant name *Monoptaxis* for the whole group of species. It is evident that the generic name *Odostomia* is prior to all the others which I have enumerated; and I am inclined to think that the definition given by its founder was sufficient. At all events that name is universally recognized.

The next question is, what are the limits of this genus? *i. e.* do the species furnished with a tooth (whatever may be their sculpture) belong to *Odostomia,* the ribbed species without a tooth to *Turbonilla* or *Chemnitzia,* and the smooth and toothless species to *Eulimella?* I cannot admit any such distinction; nor can I draw a line between *Odostomia* and *Chemnitzia,* or between either of them and *Eulimella.* I have detected the tooth in several so-called species of *Chemnitzia,* e. g. *fenestrata, lactea* (or *elegantissima*), *pusilla,* and *gracilis*; Philippi described his *C. densecostata* as having the aperture "superne subplicata;" and Clark observed in a specimen of *O. acicula* (*Eulimella acicula,* F. & H.) "a decided pillar-fold." This last observation I will confirm. Every naturalist is aware that a generic character which pervades the species taken as a whole may not be possessed by all of them. In the present case there are other characters that serve as ties of union; and not a single character can be found to distinguish any one of the three supposed genera from its allies.

The group of shells now under consideration—call it a single genus or a collection of genera—appears to be intimately related to *Aclis* on one side, and less closely on the other side to *Ianthina,* which leads through *Stilifer* to *Eulima.* Montagu suggested the conchological affinity of *O. spiralis* and other species to *Tornatella* (or *Actæon*)—a view that has been lately advocated by A. Adams, Clark, and Mörch on malacological grounds. But that genus has not a retractile proboscis, nor is the apex of its shell either reversed or inverted; and the operculum is constructed on a different plan from that of *Odostomia.* Their lingual ribands are also very distinct, although this may depend on the nature of their food.

For our knowledge of the animal we are mainly indebted to Professor Lovén, Mr. Clark, and Mr. Alder. An admirable paper by the first of these writers, on the genus *Turbonilla* of Leach (Kongl. Vet.-Akad. Förh. 1846), illustrated by figures of the animal, shell, and operculum, forms the groundwork, and is especially deserving of careful study. Mr. Clark has supplied us with elaborate details of many species. Although he exalted the science of malacology as the only method of natural classification, he could not help remarking on the singular sameness of his descriptions, and admitted that "indeed it is difficult to divest oneself of the idea that all of them appertain to the same animal"*. Sometimes his power of observation with the microscope must have been more acute than at other times. I cannot otherwise account for his stating that the tentacles of several species which he described are "setose" or "setaceous." This is but partially the case; and the following account by Mr. Alder of a remarkable peculiarity of the structure of the animal will probably explain Mr. Clark's meaning. "There exists near the apex of each ear-shaped tentacle, just within the inner margin, a circular area or lobe, set with strong vibratile cilia, which are in constant motion during the life of the animal, giving that part the appearance of a revolving wheel, while no cilia are to be found on the other part of the tentacle, except a few rigid, immoveable setæ at the apex. In one species, *O. Eulimoides* [*O. pallida*], I have observed the vibratile cilia to extend in a line from the disk down the centre of the tentacle, but confined to a very limited space. These ciliated disks are very curious, and no doubt indicate the seat of a particular function; probably they are a modification of the organs of smelling. They have not been observed in other genera." The snout ("mentum" or chin, Lovén) corresponds in position with the head of a *Rissoa,* but has a different office. It is like the snout of a pig; useful for finding food, not for eating it. The head of an *Odostomia* occupies the central space between the tentacles in front; it consists of a true proboscis, which is protruded only now and then, and appears to be suctorial. There are no jaws or spiny tongue. Some species of *Odostomia,* particularly those of the typical kind, inhabit the coasts at low-water mark, lurking beneath loose stones, and at the base of *Corallina officinalis* and small seaweeds in rock-pools; others are found in the laminarian zone; a few occur in deep water, beyond the range of vegetable life. In all probability they subsist on polyparia and other animal substances of a soft nature, because the tongue or lingual riband is edentulous. I think M. Petit must have been mistaken in saying (Journ. Conch. viii. p. 250) that they live on seaweeds. Two of our most common species (*O. pallida* and *O. unidentata*) are frequently met with on the "ears" of living *Pecten maximus* and *P. opercularis*; and, from their habitual proximity to the excretory passage of the scallop, it may not be unreasonable to infer that they subsist on its fæces. Mr. Norman was of opinion that specimens of *O. pallida,* which he dredged in the Firth of Clyde, fed on a red sponge (*Halichrondria farinaria,* Bowerbank) that occasionally covers *P. opercularis.* I have often taken specimens from the ears or wings of scallops which had no such incrustation. The shell is usually white; but a few species are banded with reddish-brown, or tinged more or less deeply with that colour. The inversion of the apex was first pointed out by Montagu. That this part of the spire is likewise sinistral, or turns to the left hand instead of to the right, has been since ascertained, and is a still more anomalous fact: it is a good and constant feature of the genus. Owing to the species being generally so prolific and widely diffused, it is excessively difficult to define their exact limits, and to say which forms are specific and which varietal. I endeavoured to perform this undertaking in a monograph which was inserted between eighteen and nineteen years ago in the 'Annals and Magazine of Natural History.' With the aid of subsequent experience and greater opportunities of comparison, I will now revise my work, professing (and indeed intending, so far as human nature permits) to treat my own discoveries with a share of justice not less rigorous than that which I measure out to my brother conchologists. I have no ambition to be a species-maker, much less have I any desire to invite that appellation. I will do my best, by descriptions and figures, to help collectors in making out what I consider true species. But I must at the same time confess having been not seldom puzzled by intermediate forms; when I almost fancied that these paradoxical lines in the 'Passionate Pilgrim' had reference to my perplexity:—

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* Ann. & Mag. N. H. Dec. 1850.

> "Reason, in itself confounded,
> Saw division grow together;
> To themselves yet either neither,
> Simple were so well compounded;
>
> That it cry'd, how true a twain,
> Seemeth this concordant one."

To show how other conchologists have failed in determining certain species, let me instance *O. plicata*, Mont. Macgillivray mistook for it a worn *O. spiralis*, S. Wood and Lovén *O. conoidea*, and Malm *O. albella.* Again, *Turbo unidentatus* of Montagu is a different species of *Odostomia* from *T. unidentatus* of Turton, as well as from *O. unidentata* of Fleming, while the shell described by Hanley, in 'British Marine Conchology,' as the last-named species, does not agree with any of the above. But, as I ask forbearance for my own faults,

> Æquum est
> Peccatis veniam poscentem reddere rursus.

The geographical distribution of the species is very extensive. Many species in public and private collections are undescribed, and an infinitely greater number remains undiscovered in the South Atlantic, Indian, Southern, and Pacific Oceans, notwithstanding the labours of Philippi, A. Adams, Pfeiffer, C. B. Adams, Gould, Stimpson, P. P. Carpenter and others. Few species have been detected in the arctic seas; and they are equally rare in glacial deposits. The geological relations of the genus have not been sufficiently investigated.

The European species were placed by writers of the Linnean school in *Turbo, Helix,* and *Voluta*; by the followers of Lamarck they were assigned to *Eulima, Melania, Turritella, Phasianella,* and *Rissoa.*

The following synopsis may be useful for the more easy discrimination of our native species:—

A. Oval or oblong, smooth, spirally striated, or (rarely) reticulated; pillar slightly curved, and invariably furnished with a tooth. (Typical.) 1. *minima*; 2. *nivosa*; 3. *truncatula*; 4. *clavula*; 5. *Lukisi*; 6. *albella*; 7. *rissoides*; 8. *pallida*; 9. *conoïdea*; 10. *umbilicaris*; 11. *acuta*; 12. *conspicua*; 13. *unidentata*; 14. *turrita*; 15. *plicata*; 16. *insculpta*; 17. *diaphana*; 18. *obliqua*; 19. *dolioliformis*; 20. *decussata.*

B. Elongated, longitudinally ribbed, or reticulated; pillar straight, and seldom furnished with a tooth. (*Turbonilla* or *Chemnitzia.*) 21. *clathrata*; 22. *indistincta*; 23. *interstincta*; 24. *spiralis*; 25. *eximia*; 26. *fenestrata*; 27. *excavata*; 28. *scalaris*; 29. *rufa*; 30. *lactea*; 31. *pusilla.*

C. Elongated, smooth and polished; pillar straight, very rarely furnished with a tooth. (*Eulimella.*) 32. *Scillæ*; 33. *acicula*; 34. *nitidissima.*

A. Typical.

1. Odostomia mi'nima*, Jeffreys.

O. minima, Jeffr. in Ann. & Mag. N. H. 3rd ser. i. p. 45, pl. ii. f. 3.

Shell forming an oblong cone, very thin, transparent and lustrous: *sculpture*, a few slight longitudinal wavy striæ: *colour* clear white: *spire* gradually tapering to a blunt, nearly globular, and inverted point: *whorls* 4–5, convex; the last is proportionally broader than the next, and exceeds in length the rest of the spire when the shell is placed with its mouth uppermost: *suture* deep, scarcely oblique: *mouth* exactly oval, slightly expanded but entire at the base; it occupies nearly one-third of the shell: *outer lip* somewhat flexuous, but neither prominent nor expanded: *inner lip* thin, adhering to the upper slope of the base and slightly reflected below; it is united with the outer lip so as to form a continuous but indistinct peristome: *umbilicus* small and narrow: *tooth* or fold slight and seldom visible: *operculum* pale yellow, delicately striated in the line of growth; spire consisting of 2–3 whorls. L. 0·05. B. 0·025.

Habitat: Living on decayed fronds and at the base of *Laminariæ*, procured by grappling just beyond low-water mark, in Lerwick Sound, and at Kyleakin in Skye (Barlee); dead in Shetland and the Hebrides, 50–60 f. (J. G. J.); St. Mawes, Falmouth (Hockin); in dredged sand from Guernsey (Waller). It either is rare or from its minuteness has escaped observation.

This is the shell noticed by Forbes and Hanley in the Appendix to their work (p. 282) as allied to *Aclis Gul-*

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* Smallest.

sonæ. From that shell it is distinguishable by its smaller size, conical rather than cylindrical shape, having fewer whorls and flexuous striæ, and especially in the mouth being entire instead of notched at the base, and in the outer lip not being expanded nor united with the inner lip. It is the smallest known species of *Odostomia*. The *Chemnitzia minima* of Hörnes, from the miocene formation near Vienna, is different from this.

2. O. NIVO'SA *, Montagu.

Turbo nivosus, Mont. Test. Br. (ii.) p. 326. *O. cylindrica*, F. & H. iii. p. 287, pl. xcvi. f. 7.

SHELL forming a cylindrical cone, not very thin, transparent and glossy: *sculpture*, 2 or 3 narrow spiral ridges on the periphery, and a single stronger one immediately below the suture of each whorl, besides close-set and extremely fine but obscure flexuous striæ in a longitudinal direction; one of the spiral ridges usually encircles the base of each upper whorl; under a microscope the whole surface appears more or less covered with numerous indistinct fine spiral lines: *colour* white, with occasionally a slight fulvous tint: *spire* tapering to an abrupt rounded and inverted point, the apex being sunk or involved in the extremity of the spire: *whorls* 4–5, somewhat compressed; the last exceeds all the rest in length and bulk: *suture* rather deep, distinctly marked by the uppermost spiral ridge: *mouth* oval, much narrower above than below, where it is expanded; it is scarcely equal in length to one-fourth of the spire: *outer lip* flexuous, inflected and contracted at the upper part: *inner lip* not very thin, adhering to the pillar, slightly reflected over the base, and occasionally united with the outer lip: *umbilicus* none; but a narrow chink may be observed in aged specimens: *tooth* small, usually concealed behind the pillar: *operculum* yellowish, strongly striated or furrowed in the line of growth, the striæ being more close-set and flexuous towards the outer side; spire very short and nearly terminal. L. 0·0625. B. 0·0325.

HABITAT: The lower part of the littoral zone, and the upper part of the laminarian zone, in the Channel Isles and south of England; Ilfracombe, and Kilkee in the west of Ireland (Alder); Cork and co. Antrim (J. G. J.); Dublin Bay (B. W. Adams); Scarborough (Bean); Clyde district (Norman, Bean, and Robertson); Skye (Barlee); outer Hebrides (J. G. J.); Aberdeenshire (Macgillivray); Dunnet Bay, Pentland Firth (Gordon); Cruden in the Moray Firth, and Hillswick Bay in Unst (Dawson); Lerwick (Barlee). Specimens from the last two places are larger than any of those from our southern coasts.

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* Snowy, for snow-white; properly *nivea*.

Montagu's type, with "*nivosus*" in his hand-writing, is still preserved in the British Museum; and his description confirms its identity with the present species. Alder described and figured this shell as *O. cylindrica*. Macgillivray gave it another name (*Annæ*) in honour of one of his daughters. It reminds one of Dr. Johnston's review of the Professor's "History of the Molluscous Animals of the counties of Aberdeen, Kincardine, and Banff" (Ann. & Mag. N. H. 1843), in which the frequent mention of his children by the author is noticed in a good-natured way, concluding with a fervent "God bless them!"

3. O. TRUNCA'TULA*, Jeffreys.

O. truncatula, Jeffr. in Ann. & Mag. N. H. 2nd ser. v. p. 109; F. & H. p. 294, pl. xcvi. f. 8.

SHELL having a considerable resemblance to *O. nivosa* in shape; but it is of a far greater size, proportionally much thinner, and of a more delicate texture; it has no spiral ridges at the base, nor the peculiar single one at the top of each whorl, although the whole surface of the present species is more or less covered obscurely with remote spiral lines; the longitudinal striæ are stronger and impart sometimes a puckered appearance to the upper part of each whorl; the colour is often yellowish in fresh specimens; the whorls are 6 or 7, and flatter or more compressed than in *O. nivosa*; the suture is channelled, and gives a turreted aspect to the spire; the mouth is longer in proportion to its breadth; the outer lip is emarginate or notched near its junction with the body-whorl; the tooth is plait-like or twisted; and the operculum is conspicuously striated. L. 0·175. B. 0·065.

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* Slightly lopped or cut off.

Habitat: Among trawl-refuse from Plymouth (Barlee and Jordan), and Falmouth (Miss Vigurs, *fide* Cocks); dredged in St. Mawe's Creek, near Falmouth (Hockin), and in 20 f. on the Turbot-bank, near Larne, co. Antrim (J. G. J.).

The proportion of length to breadth varies considerably in the Plymouth specimens. Mr. Clark called this a variety of the last species. But each has its own characters, and I have not yet seen any connecting link; the difference of size also, considered with regard to the habitat (see vol. iii. p. 27), would disincline me to unite these species. The present species is in shape not unlike the young of *Truncatella truncatula*.

4. O. CLA'VULA*, Lovén.

Turbonilla clavula, Lov. Ind. Moll. Scand. p. 18. *Eulimella clavula*, F. & H. iii. p. 314, pl. xcviii. f. 8.

Body clear frosted-white: *neck* greatly protruded, showing on the mouth a canal or groove bounded by two parallel longitudinal lines: *snout* very narrow, not grooved nor bilobed, but rounded at the extremity [rounded, bilobed (Lovén)], carried just before the foot: *tentacles* extraordinarily short and broad [mutually connected in front, and vibrating very actively (Lovén)], swelling out behind like a minute leaf; they are not divergent, but borne straight and close together; each terminates in two white inflations, viz. one quite apical, and the other immediately below it, both being nearly semicircular and as if soldered to the external sides of the points or tips: *eyes* at the inner bases of the tentacles, not very close together: *foot* flexible, more or less concave in front, with longish auricles, below which it is gradually constricted; the margins are thin, and often folded upwards; it is either bluntly or sharply pointed behind; when the animal is in motion there is on each side of the foot a marginal series of about eight very minute glossy points. Animal very active and free. (Clark.)

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* A twig; more correctly *clavulus*, a small nail?

Shell nearly cylindrical, with a rounded and produced base, thin, transparent and polished: *sculpture,* extremely fine and close-set longitudinal striæ, which can only be detected by the aid of the microscope and in certain lights: *colour* clear white: *spire* turreted, and apparently truncated at the point, which is rounded and inverted: *whorls* 4–5, rather convex, although compressed and gradually enlarging; the last two are almost equal in breadth, and the body-whorl somewhat exceeds in length the rest of the spire: *suture* nearly straight, slightly channelled above; it is defined on the under side by a narrow rim, arising from the double layer of shell in that part, the upper edge of the lower whorl being soldered on the periphery of the preceding whorl: *mouth* oval, expanded below; it occupies about one-third of the shell: *outer lip* rounded but not prominent, contracted and somewhat sharply inflated above, just below the periphery: *inner lip* not perceptible on the upper slope of the base, slightly reflected and but little curved below: *umbilicus* very small and narrow, but distinct: *tooth* or fold inconspicuous or scarcely discernible: *operculum* thin, finely striated. L. 0·08. B. 0·04.

Habitat: Dredged off Teignmouth (Clark); Torbay (Battersby and J. G. J.); Brixham (Hanley); Plymouth (Barlee); other parts of south Devon (Webster); Hebrides (Barlee and J. G. J.). It is rare, and occurs in muddy sand, between 6 and 50 f. Lovén discovered it on the coast of Sweden, in mud, among *Pennatulæ,* at a depth of 30 f. On reexamining his description and a specimen with which he favoured me, I observe that the whorls are more convex, and the suture consequently deeper, than in our shell; but such characters perhaps vary in this as they do in other species of *Odostomia.*

5. O. Lu'kisi*, Jeffreys.

O. Lukisi, Jeffr. in Ann. & Mag. N. H. 3rd ser. iii. p. 112, pl. iii. f. 19 *a*, *b*.

Shell nearly cylindrical, solid, opaque, glossy: *sculpture*, only very slight and almost microscopical scratch-like longitudinal striæ: *colour* ivory-white: *spire* abruptly terminating: *whorls* 5–6, convex, compact, gradually enlarging: the penultimate one projects a little, and is nearly as broad as the last, which occupies about three-fifths of the shell: *suture* rather deep: *mouth* oval, contracted above and expanded below, somewhat exceeding in length one-third of the spire; throat quite smooth: *outer lip* incurved on the periphery: *inner lip* thickened and spread on the pillar, joining the outer lip at the upper corner of the mouth, and slightly reflected on the lower side: *umbilicus* small but distinct: *tooth* small, prominent, and placed opposite the umbilicus: *operculum* yellowish, with a white streak in the line of the spire, very slightly striated across; flap broad: there is the same groove and corresponding ridge as in *O. conoïdea*. L. 0·1. B. 0·045.

Habitat: Guernsey, 18–20 f., dead, and Lulworth, 10–12 f., living (J. G. J.); among seaweeds at low-water mark on the south Devon coast, living (Webster); Cornwall (Hockin); Dogger bank (J. G. J.); Bundoran, co. Donegal, in drift shell-sand (Waller); Oban, dredged in 20–25 f. (M'Kenzie); Skye and Shetland (Barlee and J. G. J.).

This shell is remarkable for its ivory whiteness and solidity, in which respects it agrees with *O. conoïdea*; but that species has a more or less distinct peripheral keel, the suture is not so deep, and the throat or inside of the outer lip is invariably grooved, like the barrel of a rifle. Should the latter, however, prove not to be a permanent character, this species may be regarded as a sublittoral variety of *O. conoïdea*. The umbilicus is developed in the adult only of the present species. From the next species (*O. albella*) this differs in colour, texture, abrupt termination of the spire, greater convexity of the whorls, contraction of the outer lip, the presence of an umbilicus, and prominence of the tooth.

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* Named in honour of the late Dr. F. C. Lukis, an excellent naturalist at Guernsey.

6. O. ALBEL'LA *, Lovén.

Turbonilla albella, Lov. Ind. Moll. Scand. p. 19. *O. rissoides*, var. (provisionally), F. & H. iii. p. 286, pl. xcvi. f. 5.

BODY creamcolour, streaked with sulphur, sometimes clear white, gelatinous, and of a granular texture under a high magnifying-power: *snout* or mentum narrow, not always extended beyond the foot: *tentacles* leaf-like, rather short and thick: *eyes* small, placed close together: *foot* short, squarish in front, narrow or constricted in the middle, broader and bluntly pointed behind; sole edged with yellow.

SHELL cylindro-conical, rather thin, semitransparent, and of a dullish hue: *sculpture*, as in *O. rissoides*; the young exhibit faint spiral striæ under a microscope: *colour* pale yellowish-white, variegated in fresh specimens by reddish-brown blotches on the upper part, which represent the dried remains of the animal: *spire* tapering to a blunt point: the apex shows distinctly the reversed and inverted embryonic nucleus: *whorls* 5–6, rounded but somewhat compressed, gradually enlarging; the last occupies about three-fifths of the shell: *suture* shallow but incised; below it each whorl appears encircled by a narrow band, as in *O. rissoides*: *mouth* oval, contracted on the outer side, slightly expanded and obtusely angulated at the base; it usually equals in length one-third of the spire: *outer lip* slightly curved: *inner lip* not much spread on the pillar, nor united above with the outer lip, thickened and slightly reflected on the lower side: *umbilicus* none, although there is sometimes a narrow chink behind the inner lip: *tooth* small, retired and nearly hidden within the pillar: *operculum* yellowish, marked with white down the spire, finely and deeply striated in the line of growth, the striæ becoming very close towards the nucleus; flap not striated; groove and ridge as in *O. conoidea*; spire very short, indistinct, and nearly terminal. L. 0·115. B. 0·05.

HABITAT: Underneath loose stones at low-water mark and in the laminarian zone, on various parts of our coast from Guernsey to Shetland. Fossil in the boulder-clay of Caithness (Peach), and at Uddevalla, 40 feet above the sea-level (Malm); post-glacial shell-bank at Kirkoën, Norway, 50 feet (Sars, as *O. plicata*, Malm). Living in Norway (M'Andrew, Sars, and others), Sweden (Lovén and Malm), coasts of Denmark (mus. Copenh.), La Hougue Bay, near Cherbourg (Macé), Loire-Inférieure (Cailliaud), Sardinia (Vérany); Cailliaud gives the laminarian zone, Sars 10–40 f., and Danielssen 30–40 f. as the range of depth.

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* Whitish; properly *albula*.

In Shetland and the Hebrides it lives between tide-marks in company with *Rissoa striata* and *R. cingillus*; it floats in a supine position, like its neighbours. At Guernsey and Filey I found this species in the same spot as *O. rissoides*. When scalded, the colour of the animal becomes bright orange. Owing to Mr. Clark having included in his description not only the present species, but also *O. rissoides* and *pallida*, with their varieties, I have been unable to make any use of it, and therefore rely on my own notes as to the soft parts.

7. O. RISSOÏ'DES*, Hanley.

O rissoides, Hanl. in Proc. Zool. Soc. pt. xii. p. 18; F. & H. iii. p. 284, pl. xcvi. f. 4, and xciv. f. 7 (as *O. nitida*, var.?).

SHELL conic-oblong inclining to oval, thin, transparent, and glossy: *sculpture*, microscopical only, and consisting of very fine and numerous, but irregular and scratch-like striæ in the line of growth, besides still finer and less distinct spiral striæ: *colour* pale yellowish-white or whitish: *spire* turreted, and tapering to a blunt point; the nucleus is concealed: *whorls* 5, convex, rapidly enlarging; the last occupies two-thirds of the shell: *suture* rather deep; in living or fresh specimens the dark spiral band noticed in other species is observable below the suture on the top of each whorl: *mouth* regularly oval, not much expanded nor at all angulated below; it usually equals in length two-fifths (sometimes nearly one-half) of the spire: *outer lip* curved and rather prominent: *inner lip* very slight on the upper part, forming a mere film on the pillar, thickened and somewhat reflected on the lower part: *umbilicus* usually none, although in specimens which have a short spire there is a more or less developed chink or indentation: *tooth* small and partly concealed: *operculum* like that of *O. albella.* L. 0·125. B. 0·0625.

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* Having the aspect of a *Rissoa*.

Var. 1. *alba.* Thinner; spire produced; suture deeper and more oblique; umbilical chink very distinct. *O. alba,* Jeffr. in Ann. & Mag. N. H. 2nd ser. ii. p. 337, and 3rd ser. iii. pl. iii. f. 20, *a*, *b*.

Var. 2. *nitida.* Whorls more ventricose, and umbilicus distinct. *O. nitida,* Alder, in Ann. & Mag. N. H. xiii. p. 326, pl. viii. f. 5; F. & H. iii. p. 280, pl. xciv. f. 6.

Var. 3. *glabrata.* Nearly oblong; nucleus of spire exposed and mammillary; suture deep. *O. glabrata,* F. & H. iii. p. 283, pl. xcviii. f. 3 (not *Helix glabrata* of v. Mühlfeld, nor *Rissoa glabrata*—afterwards *punctulum*—of Philippi).

Var. 4. *dubia.* Oval, and of a more solid consistency; body-whorl longer than usual; umbilical chink distinct; tooth stronger and rather more conspicuous. *O. dubia,* Jeffr. in Ann. & Mag. N. H. 3rd ser. ii. p. 338.

Var. 5. *exilis.* Smaller and more slender; spire elongated, and suture slight.

HABITAT: The lower part of the littoral zone and throughout the laminarian zone, on all our coasts. Var. 1. Oxwich Bay near Swansea, Guernsey, Skye, and Shetland (J. G. J.); Sark (Barlee); South Devon (Webster); co. Antrim (Waller). Var. 2. Shetland (Barlee); South Devon (Webster). Var. 3. Tynemouth (Alder). Var. 4. Lower part of the laminarian zone in many places. Var. 5. South Devon (Webster). The foreign localities are Bohuslän (Lovén, in mus. Stockh.) and 15–30 f. (Malm, as *O. albella*); Danish coasts (mus. Copenh.); Etretat (J. G. J.); Morbihan (Taslé); Loire-

Inférieure (Cailliaud); Spezzia (J. G. J.); and Algiers (Weinkauff).

This is a common and therefore variable species. It may be recognized, in comparison with *O. albella,* by its more oval and less cylindrical shape, its usually thinner texture and greater lustre, more convex whorls, deeper suture, and having the mouth rounded and never angulated at the base; the last whorl is larger in proportion to the rest. Shetland specimens are very fine. Scalariform and stunted distortions sometimes occur.

Macgillivray described it as *O. scalaris,* which specific name would be entitled to priority, if Philippi had not used it for another well-known species. It is apparently the *Rissoa glabra* of Brown, and *Turbonella transparens* of Leach. The fry is probably *Helix resupinata* of Montagu, from Walker's figure 24.

8. O. PAL′LIDA *, Montagu.

Turbo pallidus, Mont. Test. Br. (ii.) p. 325, t. 21. f. 4. *O. eulimoides,* F. & H. iii. p. 273, pl. xcv. f. 1–3.

Body white, covered with minute yellow specks: *snout* narrow, expanded and rounded in front, marked down each side with a pale-yellow line: *tentacles* bevelled and pointed like an awl; each has also a yellow longitudinal line; tips inflated and white: *eyes* placed somewhat apart: *foot* short, truncated, and slightly notched in front, where it is indistinctly auricled at each corner, terminating behind in an abrupt and short point.

Shell somewhat spindle-shaped, in consequence of the elongation and angularity of the base, rather solid, nearly opaque, and moderately glossy: *sculpture,* fine and close-set microscopical spiral striæ; these may be detected with a lens of ordinary power: *colour* milk-white, with a faint orange or purplish tinge on the upper part of live specimens, derived from that of the liver; immature specimens are often yellowish: *spire* finely and regularly tapering to a blunt point:

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* Pale.

nucleus concealed: *whorls* 6–7, rather compressed, rapidly enlarging; the last occupies nearly two-thirds of the shell: *suture* more or less oblique, not deep, but distinct; the marginal band is observable in young specimens only: *mouth* more oblong than oval, contracted above, considerably expanded and angulated below; its length is about three-sevenths of the whole spire: *outer lip* gently curved, not very prominent: *inner lip* very slight on the upper part, forming a mere film on the pillar, thickened and decidedly reflected on the lower part, where it is nearly straight: *umbilicus* none; the chink, when it exists, is extremely narrow or small: *tooth* strong, partly concealed; it is (as usual) placed on the pillar in the middle of the inner lip, just where the reflexion of the latter commences: *operculum* as in the last two species; the ridge is well marked, and the striation very distinct. L. 0·2. B. 0·1.

Var. 1. *crassa.* Smaller and thicker; some of the spiral striæ confluent and forming elevated ridges. *O. crassa,* Thompson, in Ann. & Mag. N. H. xv. p. 315, pl. xix. f. 5.

Var. 2. *notata.* Whorls more convex; spiral striæ more conspicuous. *O. notata,* Jeffr. *op. cit.* 2nd ser. ii. p. 336.

Var. 3. *angusta.* Thinner and more slender. Jeffr. *op. cit.* 3rd ser. iii. pl. iii. f. 18, *a*, *b*.

Monstr. Cylindrical, with flattened whorls; or having the spire turreted.

Habitat: Chiefly (if not only) on the ears of *Pecten opercularis* and *P. maximus,* in the coralline zone; it is widely distributed and rather common. The trawl-refuse at Plymouth and Brixham is especially productive of this shell. Var. 1. Birterbuy Bay, Connemara (M'Calla, *fide* Thompson, and Barlee); Torquay (Hanley). Var. 2. Five miles east of Lerwick, in 40 f. (J. G. J.); a single specimen. Var. 3. Several places from Guernsey to Shetland, but rare; a specimen of this last variety is nearly a quarter of an inch long, and not a line in breadth. The monstrosities were dredged by Mr. Barlee in Birterbuy Bay. Fossil at Belfast, in a newer pliocene deposit (Grainger); Clyde beds (Crosskey). Recent: Mangerfiord (Sars); upper Norway, 15–70 f. (M'Andrew and Barrett, as *O. plicata*); Bohuslän, and the variety *crassa* on *Pecten maximus* (Lovén); Gottenburg, 12–20 f. (Malm); coasts of Denmark (mus. Copenhagen); Loire-Inférieure (Cailliaud); Arcachon (Fischer, as *O. conoidea*); Vigo (M'Andrew); Gulf of Lyons (Martin); Nice (Macé); Spezzia (J. G. J.); Dalmatia (Brusina, as *O. Novegradensis*). The variety *angusta* has been dredged by M. Jean Susini at Ajaccio.

Differs from *O. rissoides* in its larger size, solid texture, and milk-white colour; the spire is more tapering, and the base is pointed or angulated; the whorls are not so convex; and the mouth is considerably expanded below the pillar, where the inner lip becomes nearly straight, instead of being curved as in that species.

I have no doubt that this was Montagu's *Turbo pallidus*, judging from his detailed description and figure: although he at first says that the pillar-lip is "destitute of any tooth," in the Supplement to his work (p. 133) he expressly notices the "ridge or lengthened denticle on the columella" of that shell, as well as of *O. spiralis, unidentata, interstincta*, and *plicata*. But the specimen now in the British Museum, which has the name "*palidus*" in Montagu's handwriting affixed to the under side of the tablet, is a broken and worn *Rissoa parva*, var. *interrupta*. It is unfortunately too probable that when Dr. Leach rearranged this part of the national collection, sufficient care was not taken to preserve the identical specimens which had belonged to the first-named excellent zoologist, and that in the present case the type may have been lost, and replaced by the wretched substitute now on the museum tablet.

It is the *Voluta ambigua* of Maton and Rackett, *Turbo unidentatus* of Turton (not of Montagu), *O. unidentata* of Fleming and Macgillivray, *O. Eulimoides* of Hanley, and *Turbonilla oscitans* of Lovén. The variety *crassa* seems to be Brown's *Jaminia pullus*.

9. O. CONOÏ′DEA*, Brocchi.

Turbo conoideus, Brocchi, Conch. Foss. Subap. ii. p. 659, t. xvi. f. 2. *O. conoidea*, F. & H. iii. p. 260, pl. xcv. f. 4.

Body clear bluish-white throughout, with faint streaks of flake-white: *snout* or mentum grooved lengthwise and cloven at the extremity, so as to form a lobe on each side, divided by a narrow depressed line, and resembling a second pair of tentacles: *proboscis* issuing at the termination of the groove close under the eyes and below the centre of the tentacular veil: *tentacles* flat, bevelled, not very short ("slightly setose," Clark); tips moderately large, rounded, inflated, and flake-white: *eyes* very black, situated exactly at the internal bases of the tentacles, immersed in the skin, so close to each other that a hair can scarcely be laid between them ("I never saw the eyes so contiguous in any other mollusk," Clark): *foot* large, rather long, membranous, gently reflected at the sides on itself (which reflexion it in some measure retains on the march), deeply arched in front, causing the flanks to be pointed, and gradually tapering behind to a bluntly angular point; sole slit in the middle in front. (Lovén, Clark, and J. G. J.)

Shell oblong-conical, with a narrow and somewhat pointed base, solid, nearly opaque, of a polished lustre: *sculpture*. the usual microscopical lines of growth, besides a slight impressed line round the periphery, which is more or less distinctly keeled, especially in young or immature specimens: *colour* ivory-white: *spire* tapering to an abrupt extremity; nucleus concealed and twisted inwards: *whorls* 8, nearly flat, and gradually enlarging; the last constitutes about one-half of the shell: *suture* narrow and slightly channelled; it slopes downwards from the peripheral keel on each of the upper whorls: *mouth* oval, contracted above, somewhat expanded but scarcely angular below: its length is about one-third of the whole spire: *outer lip* gently curved, inflected just below the periphery; inside deeply grooved in the direction of the spire, like the barrel of a rifle; the grooves are 8 or 9 in number and terminate in small denticles or notches within the mouth; they are often visible outside: *inner lip* adhering to the pillar above the tooth, and joining the outer lip at its upper angle, reflected and curved below the tooth: *umbilicus* small but deep, partly covered by the reflexion of the inner lip: *tooth* strong, prominent and conspicuous, placed just behind the umbilicus; it winds round the pillar from one end of the spire to the other, like the worm of a corkscrew: *operculum* yellowish-brown, of equal proportionate solidity with that of *Cyclostoma elegans*, and exquisitely sculptured by close-set flexuous striæ in the line of growth; it has a curved groove down the middle, which ends in the spire of the operculum, and gives to the portion thus separated in front a cornucopia-shape; this groove is deep and very distinct; side-flap rather broad, widening with the growth of the operculum, and divided from the spiral part by a narrow line. L. 0·25. B. 0·1.

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* Having a conical appearance.

Var. *australis*. Smaller and narrower.

Habitat: Coralline and deep-sea zones, in mud, from 25 to 80 f., throughout Shetland and Scotland; Isle of Man (Forbes, as *O. plicata* apparently). It is locally plentiful in the Clyde district and Hebrides. The variety has a southern range, comprising the Channel Isles, Dorset, Devon, Cornwall, Galway, and Cork; in rock-pools, Falmouth (Barlee, and Miss Vigurs, *fide* Cocks); among *Zostera*, Jersey (Dodd). This species was originally described as a fossil by Brocchi from the Sub-apennine tertiaries, and it has been recorded by Philippi from basaltic tufa at Militello, by Nyst (as *O. plicata*) from Belgium, and by Searles Wood (under the latter name) from our Coralline Crag; the Rev. H. W. Crosskey has found it in the Clyde beds, and M. Macé in an upper miocene deposit near Antibes. The ordinary or typical form inhabits the North Sea, from Hammerfest, 40 f. (Sars), to Gottenburg, 12 f. (Malm); and the variety is distributed along the European coasts of the Atlantic from Brittany, in the laminarian zone (Cailliaud), to Gibraltar, 8–30 f. (M'Andrew), every part of the Mediterranean, from 10 to 50 f. (Scacchi and others), the Adriatic (Brusina, as *O. Nagli*), the Ægean, 7–41 f. (Forbes and Spratt), perhaps the Red Sea (Philippi), and the Canaries, 12–60 f. (M'Andrew).

"The animal is vivacious, displays the eyes on the march, and makes rapid progression. The head and cloven muzzle nearly resemble those organs in *Jeffreysia diaphana*" (Clark, MS.). The front side of the foot is fringed with microscopical and extremely short cilia, which are in a state of incessant motion when the animal is crawling. Brocchi imagined that this species was terrestrial or lacustrine, and belonged to the genus *Auricularia* [*Auricula*] of Lamarck. The shell is certainly not very unlike *Melampus bidentatus.*

It is probably the *O. plicata* of Fleming—certainly that of S. Wood,—and the *Turbonilla plicata* of Lovén. Scacchi described and figured it as *Rissoa polita.* Hanley called it *O. unidentata,* myself *O. eulimoides,* and Leach *Alvania Cranchiana.* The typical form appears to be the *Odontostomia erythræa* of Philippi as well as his *O. sicula* (cf. Zeitschr. f. Mal. 1849 and 1851).

10. O. UMBILICA'RIS*, Malm.

Turbonilla umbilicaris, Malm, Götheb. k. Vet. Handl. (new series) no. viii. p. 128, pl. 2. f. 10.

SHELL forming a short cone, thin, transparent, and remarkably glossy: *sculpture,* none except under a high microscopical power, when some extremely slight spiral striæ are discernible in a favourable light: *colour* clear white, with a very faint bluish tint: *spire* short, ending in a rather blunt and rounded point, owing to the inversion of the apex: *whorls* 5–6, convex, very compact, gradually enlarging; the last occupies three-fifths of the shell; *suture* deep, imparting a slightly turreted appearance to the whorls; owing to the transparency of the shell the periphery of each of the upper whorls appears like a narrow band round the top of the succeeding whorl: *mouth* oval, expanding below; it somewhat exceeds in length one-third of the spire: *outer lip* slightly reflected, not much spread over the pillar, nor extending to the upper part of the outer lip; it is more or less angulated below: *umbilicus* very distinct although small: *tooth* small, prominent, and placed opposite the umbilicus: *operculum* yellowish and rather solid, closely and finely striated across; it is divided lengthwise about one-third the distance from the pillar by a curved groove, which forms a ridge on the under side; inner side straight; flap narrow; spire consisting of 2 or 3 whorls. L. 0·1. B. 0·05.

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* Umbilicate.

Var. *elongata*. Spire more produced.

HABITAT: Coralline zone, in Torbay (Battersby); south of Devon (Webster); Land's End (Hockin); Oban (M'Kenzie); Loch Fyne, west of Scotland, and Lerwick (Barlee); Aberdeenshire (Dawson); Shetland (M'Andrew). Of the variety I found a single specimen by dredging in *Zostera*-ground at Southampton. The only extra-British localities to my knowledge are the coast of Bohuslän, in 12 f. (with *Mytilus Adriaticus*) and also in 20 f., as well as on Eggers Bank, Norway, in 150 f. (Malm), and in Finmark (Lilljeborg); the Norwegian specimens are of unusually large size, but possess all the characters of the species. It seems to be everywhere rare.

Malm has well remarked that this species is easily distinguished from any other by its conspicuous umbilicus, glossy surface, and convex whorls.

11. O. ACU'TA*, Jeffreys.

O. acu'ta, Jeffr. in Ann. & Mag. N. H. 2nd ser. ii. p. 338; F. & H. iii. p. 269, pl. xcvii. f. 8, 9.

BODY dirty white, speckled with pale-yellow, red, brown or leadcolour points, which are irregularly distributed over many of the external organs: *mantle* folded at the upper angle of the mouth of the shell, so as to form a tubular canal: *snout* slender, deeply channelled or hollowed out lengthwise, and having a spoon-shaped extremity: *tentacles* moderately long, and divergent; each has a flake-white longitudinal line in the middle, running from base to point; edges slightly folded; tips less white and inflated than in allied species: *eyes* rather close together in the centre behind the tentacles: *foot* short, of a more opaque white than the rest of the body; it is excavated in front, and so deeply divided or lobed as occasionally, when fully extended, to present the appearance of a second pair of short tentacles; it terminates behind in a more or less obtuse point. (Clark.)

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* Pointed.

SHELL pyramidal, with a broad base, rather solid but semi-transparent, and lustrous: *sculpture*, extremely fine and rather numerous microscopical spiral striæ, and still more minute and close-set flexuous lines of growth; a slight peripheral keel is also observable in every stage of growth, but especially in young and half-grown specimens: *colour* whitish, with a tinge of pink or fleshcolour: *spire* gradually tapering; nucleus exposed and inverted on the back, in nearly a horizontal position: *whorls* 6 (besides the embryonic ones), rounded although compressed, compact and gradually enlarging; the last occupies about one-half of the shell: *suture* very narrow and slightly excavated, sloping a little downwards in consequence of the peripheral keel: *mouth* roundish-oval, contracted above, and somewhat expanded but scarcely angular below; its length is less than a third of the whole spire: *outer lip* gently curved, inflected just below the periphery: *inner lip* adhering to the pillar above the tooth, and joining the outer lip at its upper angle, slightly reflected and more or less curved below the tooth: *umbilicus* developed and conspicuous, although small; its entrance is through a channel behind the lower part of the inner lip: *tooth* strong and prominent, placed just behind the umbilical opening; in construction and extent it resembles that of the last species: *operculum* yellowish-brown, finely and closely striated; the curved groove is unusually distinct. L. 0·175. B. 0·075.

Var. *umbilicata*. Shell larger, stronger, and white, with a broad base and usually a wider and deeper umbilicus; peripheral keel obscure. *O. umbilicata*, Alder, in Trans. Tyneside Nat. Field Club, i. p. 359.

HABITAT: Coralline zone in various parts of the sea, especially in South Devon. Cornwall, Dorset, the Channel Isles, Ireland, west of Scotland, Aberdeenshire, and Shetland may also be mentioned as localities. The variety was taken at Tynemouth by Mr. Alder, in Bantry Bay by Mr. M'Andrew, and in St. Catherine's Bay, Jersey, by the Rev. Mr. Norman. Mr. Searles Wood's collection of Crag shells in the British Museum contains a specimen of the typical form. Its known distribution in a living state beyond our seas is as follows:—Upper Norway (M'Andrew); Bohuslän (coll. Lovén in mus. Stockh., 10–30 f., Malm and Lilljeborg); Loire-Inférieure (Cailliaud); north coast of Spain, 30 f., Cape Trafalgar, and Teneriffe (M'Andrew); Spezzia (J. G. J.).

According to Clark, the animal is lively, active, and bold. He says that in some of his Exmouth specimens the throat of the shell is grooved. I have failed to detect this character in any of the specimens (at least 100) which I have examined. The umbilicus is visible even in the young. This species may be distinguished from *O. umbilicaris* by its greater solidity, the periphery being always keeled, the spire much longer, and the whorls compressed instead of convex. From *O. conoïdea* it differs in its smaller size, pyramidal shape, wider base, and in the throat or inside of the outer lip being usually (if not invariably) smooth.

12. O. CONSPI'CUA*, Alder.

O. conspicua, Ald. in Trans. Tynes. Nat. Field Club, i. p. 359; F. & H. iii. p. 263, pl. xcv. f. 6.

SHELL forming an elongated cone with rather a broad base, solid, opaque, glossy and of a polished appearance: *sculpture*, fine and numerous, but irregular microscopical spiral striæ, and still more minute and close-set flexuous lines of growth; the periphery is slightly but distinctly keeled or angulated, as is also the base of each of the upper whorls: *colour* pale chocolate, or creamcolour stained with madder: *spire* pyramidally tapering; nucleus exposed and lying in nearly a horizontal position across the apex: *whorls* 8 (besides 2, which are embryonic and reversed), flattened; the last occupies about one-half of the shell: *suture* narrow, but excavated, sloping downwards in consequence of the peripheral keel: *mouth* rhomboidal, contracted above, considerably expanded and angulated below; its length somewhat exceeds a third of the whole spire: *outer lip* obtuse-angled in the middle, and incurved just below the periphery; the inside or throat is finely but obscurely grooved in the direction of the spire: *inner lip* slight on the upper part, where it adheres to the pillar and joins the outer lip, reflected and nearly straight on the lower part, the angle at the base being very remarkable: *umbilicus* extremely small, and almost covered by the lower part of the inner lip: *tooth* strong, prominent and conspicuous, placed opposite and behind the umbilicus; it forms a sharp fold or ridge, which winds along the pillar throughout the spire. L. 0·35. B. 0·15.

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* Remarkable.

HABITAT: Coralline zone, off Whitburn, and Douglas in the Isle of Man (Alder); Herm, on the shell-beach (Metcalfe), and Guernsey, in 18–20 f. (J. G. J.); Larne, co. Antrim (Hyndman, *fide* Alder); Loch Fyne (A. M'Nab); Aberdeenshire (Dawson); Shetland (Barlee). Bohuslän (Lovén in mus. Stockh., and Malm in mus. Gottenb.); La Hougue Bay, Brittany (Macé); Lisbon (M'Andrew); Gulf of Lyons (Martin); Spezzia, in 10–12 f. (J. G. J.); Adriatic (Nardo); Sardinia and Naples (Tiberi).

By far the largest and rarest species in this section; it deserves its specific name. Independently of size, the whorls are less compact than in *O. acuta*, the keel is stronger, the mouth squarish, and the umbilicus reduced almost to nothing.

It is the *O. unidentata* of Hanley, in Thorpe's 'British Marine Conchology.' Malm mistook for this species an old and imperfect specimen of the next.

13. O. UNIDENTA'TA *, Montagu.

Turbo unidentatus, Mont. Test. Br. (ii.) p. 324. *O. unidentata*, F. & H. iii. p. 264, pl. xcv. f. 7, 8.

BODY clear bluish-white: *snout* compressed, bevelled at the margin, and truncated in front: *tentacles* short, broad, awl-shaped, "setose" [?], blunt, with a fine transparent line down the middle of each: *eyes* close together, sunken in the membrane which connects the tentacles: *foot* short, truncated in front and slightly eared, sloping behind to a broad, obtuse, lance-shaped point; sole in front flake-white, behind hyaline, with a fine longitudinal line along the centre of the posterior half; it is divided from the upper disk by a shallow groove, giving the foot a labiated aspect. (Clark.)

SHELL, a rather long cone with a broad base, solid, almost opaque, and glossy: *sculpture*, microscopical and slight but close-set spiral striæ, and a more or less distinct keel round the periphery, as well as at the base of each of the upper whorls: *colour* milk-white, with a bluish tint in immature specimens: *spire* shortish; nucleus exposed, twisted in some specimens backwards, and in others forwards: *whorls* 6, besides those of the embryonic nucleus; they gradually enlarge, and are nearly flat; the last equals in length the rest of the spire; *suture* narrow but distinct, defined above by the peripheral keel, from which it slopes downwards: *mouth* squarish, expanded and forming nearly a right angle at the inner base; its length is about a third of the whole spire: *outer lip* nearly semicircular, incurved (but not much) just below the periphery: *inner lip* extremely thin on the upper part, where it adheres to the pillar but does not join the outer lip, reflected and nearly straight on the lower part, the angle at the base being well marked: *umbilicus* none, although there is sometimes a small chink: *tooth* large, strong, prominent and conspicuous, placed as in several of the species last described; it is continued throughout the spire: *operculum* as in *O. conoïdea*. L. 0·2. B. 0·1.

Var. *elata*. Spire more elongated, and base narrower.

HABITAT: Under stones at low-water mark of spring tides, and on old oyster-shells and *Pecten maximus* in the laminarian and coralline zones, on every part of our coasts. Fossil in the Clyde beds (Crosskey), and in the glacial and post-glacial formations in Norway at the respective heights of 400–460 feet and 50–100 feet (Sars). Its foreign distribution is doubtful, because this species has not been satisfactorily identified by some continental authors. For instance, Petit has recorded it from the Gulf of Lyons on the authority of M. Martin, and Vérany from Nice; but in both these cases I ascertained that *O. pallida* had been mistaken for the present species. I must for the same reason question the locality of Algeria given by M. Weinkauff. The following, however, may be relied on:—Norway as far north as Hammerfest, in 10–50 f. (Sars); Strömstad, Bohuslän, on an oyster from 12 f. (Rubenson, *fide* Malm); and Loire-Inférieure (Cailliaud).

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* Single-toothed.

From Mr. Clark's account the animal differs little from that of *O. acuta*. The shell may be distinguished from that and other allied species by its squarish mouth and nearly rectangular base, and from *O. conspicua* by its smaller size, colour, and smooth throat. I found a living specimen which had lost all the upper part of the spire.

It is the *Sabanæa Montaguana* of Leach, taking his synonymy as my guide: his description is so vague and almost unintelligible, that it would serve for any of the smooth species.

14. O. TURRI'TA*, Hanley.

O. turrita, Hanl. in Proc. Zool. Soc. pt. xii. p. 18. *O. unidentata*, var.?, F. & H. iii. p. 267, pl. xcv. f. 9.

BODY white, with a bluish tinge, and transparent, covered with exceedingly minute granules, which give the surface (especially the foot) a frosted appearance: *snout* narrow, rounded in front, a little in advance of the foot: *tentacles* rather long and leaf-like, with blunt tips: *eyes* very small, placed close together on the middle of the neck between the tentacles at their inner base: *foot* rather broad, more or less indented (and now and then deeply bilobed) in front, obliquely truncated and irregularly bilobed behind.

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* Turreted.

SHELL forming a somewhat cylindrical cone, strong and solid, semitransparent and glossy: *sculpture* none, unless examined with a magnifying-power, when the surface appears covered by fine and regular spiral striæ; the periphery is slightly keeled: *colour* pale yellowish-white or whitish, with a dark border below the suture in each whorl as in many other of the smooth and semitransparent species: *spire* rather long, turreted, and abruptly terminating; nucleus exposed, usually twisted forwards: *whorls* 5–6 (besides those composing the nucleus), convex, and gradually enlarging; the last forms one-half of the spire, and scarcely exceeds the next in breadth: *suture* narrow, but well defined: *mouth* squarish, not much expanded or angulated at the inner base; it is proportionally small, and its length is scarcely a third of the whole spire: *outer lip* projecting but little beyond the periphery, below which it is considerably incurved towards the pillar, thus contracting the mouth: *inner lip* thin, and adhering to the pillar on the upper part, without joining the outer lip, thickened, reflected, and gently curved on the lower part, the basal angle being usually slight: *umbilicus* none: *tooth* small, not prominent, nor very conspicuous: *operculum* of a thinner texture and less strongly striated than that of *O. conoïdea* or the last species. L. 0·125. B. 0·05.

Var. *striolata*. More conical, with a shorter spire and larger mouth; the periphery is bluntly angulated; the tooth is stronger, and prominent; and the spiral striæ are unusually distinct. *O. striolata*, (Alder) F. & H. iii. p. 267, pl. xcv. f. 5.

HABITAT: Under stones and in rock-pools at low-water mark, and among seaweeds in the laminarian zone; it is widely distributed and not uncommon. A specimen of the variety was found by Mr. Alder in shell-sand from Ilfracombe; Mr. Norman has taken it in Bantry Bay, and Mr. Hockin at the Land's End. I noticed the typical form in the Royal Museum at Copenhagen (from the

Cattegat), and also among shells collected by M. Cailliaud in Brittany, by M. Macé at Cannes, and by Mr. M'Andrew (of a smaller size) off Teneriffe; it was likewise procured by me while dredging in the Gulf of Spezzia.

The animal floats, like a *Jeffreysia*; and, when crawling, it has the same habit of withdrawing its eyes, which are visible through the shell. It appears to be inactive, because Foraminifera are sometimes seen attached to living specimens. This species is remarkable for its contracted mouth; it is much more slender than *O. unidentata,* the peripheral keel is less distinct, the base is scarcely angulated, and the tooth is proportionally smaller and not so prominent or conspicuous. Although variable in size, it never attains half the dimensions of that species.

I have united *O. striolata* with the present species, in consequence of finding intermediate forms which may belong to one or the other. I must also refer to it the varieties *a* and *b* of *O. plicata,* described in my monograph.

15. O. PLICA'TA *, Montagu.

Turbo plicatus, Mont. Test. Br. (ii.) p. 325, t. 21. f. 2. *O. plicata*, F. & H. iii. p. 271, pl. xcviii. f. 1, 2.

BODY whitish, with minute and close-set yellow specks: *snout* small, wedge-shaped, flexible and extensile: *tentacles* leaf-like, and presenting three equal-sized, angular and flattened sides, which are folded a little inwards; tips rounded but not much inflated: *eyes* not quite so close together as in some other species, seated on the tentacles, at their inner bases: *foot* squarish in front and bluntly pointed behind; sole slightly grooved lengthwise on the posterior half.

SHELL slender, with a narrow and attenuated base, thin, transparent, and of a lustrous polish: *sculpture* none, except microscopical and extremely slight but numerous spiral striæ, which can only be detected at certain angles of light; periphery not keeled or angulated: *colour* very pale yellowish-white or whitish, with a dark border below the suture, caused by a thickening of that part: *spire* long and finely tapering to a blunt point; nucleus exposed, and twisted in different directions: *whorls* 5–6 (exclusive of the nucleus), rounded but much compressed, and gradually enlarging; the last occupies rather more than one-half of the shell if viewed with the mouth upwards, and about two-fifths if viewed with the mouth downwards: *suture* slight, somewhat more oblique than in the last species: *mouth* oval, inclining to oblong, narrow and acute-angled above, rounded and scarcely expanded below; its length equals a third of the whole spire: *outer lip* rather flexuous, not projecting beyond the periphery: *inner lip* thin, adhering to the pillar on the upper part, and united with the outer lip; the lower portion is thickened, reflected, and curved: *umbilicus* none, although full-grown specimens have a narrow chink: *tooth* small, more prominent and conspicuous than in the last species: *operculum* thicker on the inner than the outer side of the mouth, coarsely striated, and sometimes having a white streak down the middle. L. 0·1. B. 0·04.

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* Furnished with a plait or fold.

HABITAT: Under loose stones and among seaweeds at low-water mark, in the Channel Isles, South Devon, Dorset, Cornwall, and Bristol Channel, as well as at Fishguard, Barmouth, and Cork; it is tolerably abundant in the sublittoral zone at Exmouth. These are all the places which I can vouch for; *O. turrita* has been frequently mistaken for the present species. This probably has only a southern range, comprising the north of France (J. G. J., Macé, Taslé, and Cailliaud), Provence (Martin), Antibes (Macé), Nice (Vérany), Spezzia (J. G. J.), Corsica (Susini), and Dalmatia (Brusina). Weinkauff has enumerated it among his Algerian shells.

The characters by which this species may be known from the last are, narrower and slenderer, thin, transparent, and much more glossy, having a longer and tapering spire, a slight suture, nearly flat whorls, a differently shaped mouth, and no peripheral keel.

It is the *Voluta plicatula* of Dillwyn, and apparently the *Eulima unidens* of Requien, *Turbonella angusta* of Leach, and *O. vitrea* of Brusina.

16. O. INSCULP'TA *, Montagu.

Turbo insculptus, Mont. Test. Br. Suppl. p. 129. *O. insculpta*, F. & H. iii. p. 289, pl. xcvi. f. 6.

BODY opaque frosted-white, with a rather large patch of dull claret-red on the back: *mantle* having the usual fold at the upper angle of the aperture of the shell: *snout* short, cloven nearly to the eyes, each lobe being deeply curved outwards: *tentacles* coalescing at their bases, very broad and short; tips very small, white, and slightly inflated: *eyes* close together: *foot* deeply notched in front, forming at each corner a divergent acute auricle, behind which it becomes a little constricted, and terminates in two symmetrical distinct pointed tails or streamers, which describe an angle of separation equal to that of the fore and middle fingers when placed as far apart as possible. (Clark.)

SHELL somewhat cylindrical, with a narrow base, thin, semitransparent and glossy: *sculpture*, distinct and regular spiral incised lines or narrow grooves, which cover the lower three-fourths or even more of the last whorl, and the lower half of each of the preceding whorls; these lines are not microscopical, but visible to a sharp eye without a lens; the upper part of each whorl below the suture is marked by fine, slight, and numerous flexuous lines in a longitudinal direction, which by crossing the upper rows of spiral striæ produce in the latter an imperfectly punctured appearance; the whole surface is also sculptured with microscopical and close-set spiral striæ, which can only be detected in "live" or fresh specimens and at a certain incidence of light: *colour* pale white, assuming an ivory lustre in "dead" or faded specimens: *spire* long, somewhat turreted, and having a truncated apex; nucleus obliquely declining, and concealed: *whorls* 6, convex although more or less compressed; each has a narrow and thick rim immediately below the suture; the rate of their enlargement is rather quick, the last occupying about one-half of the shell: *suture* narrow, slightly channelled, and somewhat oblique: *mouth* irregularly oblong, owing to the inflexion and curvature of the outer lip; it is acute-angled above (but not so sharply as in *O. plicata*), and decidedly expanded below; its length equals a third of the whole spire: *outer lip* remarkably flexuous, retreating at the upper corner of the mouth, where it forms a deep sinus, and inflected in the middle, so as to contract the mouth on that side: *inner lip* as in the last species; the lower part, however, is more reflected and straight in the present species: *umbilicus* small and narrow: *tooth*—or rather an oblique fold—retired and inconspicuous, although always present: *operculum* remarkably thin, light-horncolour, narrow, and obliquely striated. (This description of the operculum is taken from Mr. Clark's account.) L. 0·15. B. 0·0625.

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* Engraved.

Habitat: Coralline and deep-sea zones, throughout the British seas, from 10 to 85 f.; not common. I have noted 26 localities. Coralline Crag, Sutton (S. Wood); post-glacial shell-banks near Drontheim, 60–80 feet (Sars). It has been found living at Dröbak in Christianiafiord, in 50 f., and at the Loffoden Isles, in 50–100 f., by Sars, at Kullen in South Sweden by Örsted (and named by Lovén *Turbonilla obliqua*), at Gottenburg, in 16 f., by Malm (who described it as *T. Warrenii*), and in Brittany by Cailliaud and Taslé.

The incised revolving lines round the lower part of each whorl readily serve to recognize this species in comparison with any of the foregoing.

It is in all probability the *Turbo divisus* of Adams, with rather more doubt *Pyramis nivosus* of Brown, and unquestionably *Turbonella transparens* of Leach, if reliance is to be placed on the authenticity of his type in the British Museum. But, in his 'Mollusca of Great Britain,' the last-named species is described as "very smooth," and the few other characters there given are common to all its congeners of the present section.

17. O. DIA'PHANA*, Jeffreys.

O. diaphana, Jeffr. in Ann. & Mag. N. H. 2nd ser. ii. p. 341; Sowerby, Ill. Ind. pl. 17. f. 23.

BODY brilliant frosted subhyaline-white: *mantle* forming a conspicuous tubular fold at the upper angle of the aperture of the shell: *snout* short, cloven in the centre almost to the eyes; each segment or lobe has an outward curve equal to an angle of 40°: *tentacles* strong, rather long, without much auriform folding, roundish and taper, terminating in minute circular snow-white inflated tips; instead of the tentacles moderately diverging on each side of the snout, they are widely curved and carried at a right angle to the axis of the shell: *eyes* close together, at the internal basal angles of the tentacles: *foot* long, broad, and thin, rather concave in front, slightly auricled, and when fully extended reaching beyond the body-whorl in front; it terminates in a distinct bifurcation, which is very apparent in slow march, but, on a quicker pace being attained, the fork in some measure decreases in consequence of the greater extension of the foot. (Clark; as *Chemnitzia obliqua.*)

SHELL inclining to spindle-shaped, very thin, nearly transparent, and lustrous: *sculpture* none, except slight flexuous and numerous microscopical striæ in the line of growth: *colour* whitish: *spire* rather long, abruptly truncated; nucleus obliquely declining and concealed, raised in front and twisted backwards: *whorls* 4, convex, and rapidly enlarging; the last occupies two-thirds of the shell; the upper part of each is encircled by a thickened rim: *suture* narrow, but well defined, and oblique: *mouth* rather oblong than oval, narrow and acute-angled above, expanded below; its length exceeds two-fifths of the whole spire: *outer lip* flexuous, retreating at the upper corner of the mouth, where it forms a rather deep sinus, and projecting in the middle: *inner lip* extremely slight on the upper part, thickened, and gently curved, but very little reflected, on the lower part: *umbilicus* developed in the adult only, when it is small and inconspicuous, being approached by a narrow canal or groove from the base: *tooth* consisting of an insignificant and retired fold: *operculum* extremely thin, except on the inner side, light-yellow, scored obliquely by fine and close-set flexuous lines, and having a distinct but short and nearly terminal spire of two minute whorls; it resembles in shape a *Cristellaria*. L. 0·1. B. 0·05.

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* Transparent.

Habitat: Coralline zone, 12–50f., Guernsey (J. G. J.), Fowey (Barlee), Exmouth (Clark), Hebrides (J. G. J.), Aberdeenshire (Dawson), Shetland (Barlee and J. G. J.); it is both local and rare. I am not aware of any geological or foreign locality.

This species differs from *O. insculpta* in being more spindle-shaped than cylindrical, of a thinner texture, quite smooth instead of spirally striated, having fewer whorls (the last being disproportionately large), with a more oblique suture, and in the umbilicus being narrow and inconspicuous. It is certainly not the young of *O. obliqua*, as Forbes and Hanley supposed. The present species is in every state of growth more slender (in consequence of the whorls not being so tumid); nor is it ever striated, like that species; the umbilicus also is smaller, and the nucleus of the spire less prominent. Mr. Clark's description of the animal of *O. obliqua* was taken from a specimen of *O. diaphana*, which is now in the fine collection of Mr. Leckenby at Scarborough.

18. O. OBLI'QUA*, Alder.

O.? obliqua, Alder in Ann. & Mag. N. H. xiii. p. 327, pl. viii. f. 12. *O. obliqua*, F. & H. iii. p. 291, pl. xcvi. f. 1.

Body clear white, with a slightly frosted appearance: *mantle* occasionally forming a small conduit or fold at the upper angle of the aperture of the shell: *snout* short, cloven as far as the eyes, having the segments curved to the right and left: *tentacles* short, bevelled, not broad, tapering to a fine point, and having small white inflated tips; they are carried in front of the head with an angular divergence of about 75°: *eyes* close together, at the united internal bases of the tentacles: *foot* short, concave in front, slightly auricled, terminating obtusely behind. (Clark.)

Shell shaped like that of a miniature *Limnæa* of the *stagnalis* type, extremely thin, transparent, and glossy: *sculpture*, fine and close-set striæ, which become stronger and more remote on the base: *colour* whitish: *spire* long and tapering, somewhat turreted; nucleus partly exposed, and prominent, twisted upwards in front, and sloping towards the back: *whorls* 5 (including the uppermost, from which the nucleus springs), tumid, and very rapidly enlarging; the last constitutes more than two-thirds of the shell: *suture* deep and oblique: *mouth* oblong or pear-shaped, narrow and contracted above, considerably expanded or effuse below; it exceeds in length two-fifths of the whole spire: *outer lip* flexuous, retreating, and sinuated at the upper corner of the mouth, where it is incurved on the periphery: *inner lip* receding (almost concealed from view), and remarkably thin on the upper part, thickened and reflected, but not much curved, on the lower part; it forms an obtuse angle or point at the base: *umbilicus* none, or consisting of an oblique depression, which sometimes ends in a small chink: *tooth*, only a slight and obscure fold: *operculum* as in the last species, but less strongly striated. L. 0·2. B. 0·075.

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* Slanting.

Var. *Warreni*. Smaller; having the basal striæ more distinct, and the umbilicus more developed. *Rissoa Warreni*, Thompson, in Ann. & Mag. N. H. xv. p. 315, pl. xix. f. 4. *O. Warrenii*, F. & H. iii. p. 292, pl. xcvi. f. 2, 3.

Habitat: Tynemouth (Alder), west of Scotland (Barlee), Aberdeenshire (Dawson), Skye, Shetland, Cork, Bantry, Caswell Bay near Swansea, Exmouth, Falmouth, Guernsey, and Herm (J. G. J.), Herm (Hanley), west of Ireland (Thompson, *fide* Alder), Helford (Hockin). Its foreign range appears to be, Löken in South Sweden, 20 f. (Malm); and Etretat in Normandy, at the same depth (J. G. J.). The variety has been taken in Dublin Bay by the late Mr. T. W. Warren, on the Turbot-bank off Larne, co. Antrim (Waller), Birterbuy Bay, co. Galway, Burrow Island near Kingsbridge, and in rock-pools at Gwyllyn-vase near Falmouth (Barlee), living at low-water mark at Budleigh Salterton near Exmouth (Clark), Land's End and Falmouth (Hockin). M. Macé found the variety at Cannes; Mr. Hanley dredged it at Villafranca, and I at Spezzia.

A monstrous specimen, from Guernsey, of this comparatively rare species has a remarkably thick and strong varix or rib-like callosity in the middle of the body-whorl. Mr. Alder noticed the striæ on the typical form.

This species may be the *Auriculina exilissima* of Brusina, from Melada in Dalmatia.

19. O. DOLIOLIFOR'MIS*, Jeffreys.

O. dolioliformis, Jeffr. in Ann. & Mag. N. H. 2nd ser. ii. p. 342; F. & H. iii. p. 301, pl. xcvii. f. 5.

BODY hyaline pale azure: *mantle* slightly channelled at the upper angle of the shell on the right side: *snout* considerably in advance of the foot when the animal is in active motion, scarcely extending to its front edge when at rest: *tentacles* proportionally larger than in other species, not so triangular, nor furnished with such broad lateral membranes, nor do they coalesce so decidedly as in other species to form a veil; the tip of each has a point of flake-white: *eyes* as usual: *foot* apparently divided into two parts; the anterior or front portion is constricted, slender, attenuated, and very extensile, slightly auricled and notched, and nearly clear white; the posterior or hinder portion is somewhat oval, short, broad, fleshy, of an opaque pale drab, and divided in the middle by a deep longitudinal fissure or groove, that seems almost to separate this portion into two equal lobes, which terminate together in a rounded point with a narrow central notch. (Clark.)

SHELL oval, resembling *Dolium perdix* in shape, rather thin, semitransparent, and somewhat glossy: *sculpture*, about 20 remote and sometimes wavy spiral striæ, which are almost perceptible by the naked eye; the microscopical lines of growth are numerous and very slight; these do not cross the striæ, nor impart any "quasireticulated" appearance, as noticed by Mr. Clark: *colour* whitish, with a faint tinge of yellow in live specimens: *spire* remarkably short; nucleus twisted horizontally in different directions: *whorls* 3 only, besides those of the nucleus or apex; they are ventricose, but compressed towards the suture and front edge, and suddenly enlarge; the last occupies nearly the whole of the shell when viewed with the mouth upwards, and at least two-thirds of it when viewed in an opposite position: *suture* channelled, rather oblique: *mouth* roundish-oval, not contracted above, slightly expanded below; it considerably exceeds in length one-half of the whole spire: *outer lip* abruptly incurved on the periphery: *inner lip* thin on the upper part (where it is united with the outer lip), broad, thickened, a little reflected, almost straight, and shelving outwards on the lower part, which is more than thrice as long as the other: *umbilicus* consisting of a narrow, although distinct, depression, which terminates in a small chink: *tooth* strong, conspicuous, like a short thorn, projecting from the middle of the inner or pillar-lip: *operculum*, according to Mr. Clark, cartilaginous and flexible, with the striæ of growth arranged in elliptical curves, as in *O. pallida*. L. 0·075. B. 0·05.

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* Having the aspect of a small species of *Dolium*.

Habitat: Aberdeenshire (Dawson); Hebrides (Barlee); Scarborough (Bean and J. G. J.); Barmouth, Tenby, Swansea, Sandwich, Paington, and Guernsey (J. G. J.); littoral zone, Exmouth (Clark); Burrow Island (Barlee); Hayle and Land's End (Hockin). Local and rare. M. Taslé has found this species at Morbihan in Brittany; and I dredged it in the Gulf of Spezzia.

It is impossible to determine Walker's shell, fig. 55, which Montagu named *Turbo Sandvicensis*. The characteristic word "reticulatis," used by Walker in his short diagnosis, with reference to the whorls, is applicable to *O. decussata*, but not to the shell which I have now described; if the figure were the sole criterion, I should be disposed to assign it to the present species.

20. O. decussa'ta*, Montagu.

Turbo decussatus, Mont. Test. Br. (ii.) p. 322, t. 12. f. 4. *O. decussata*, F. & H. iii. p. 303, pl. xcvii. f. 6, 7.

Body clear white, except the head, which is pale-pink or red: *snout* small, somewhat cylindrical, narrow, and attenuated towards the point, where it assumes a clavate or hammer-like appearance, becoming thick, angular, bevelled to a sudden edge, and straight or truncated in front: *tentacles* very short, not much folded, terminating in indistinct flake-white lobes; the lateral membranes, which are not so extensive as in other species, coalesce and form a shallow veil: *eyes* very close together, exactly at the internal bases of the tentacles, "not immersed, but a little elevated on minute prominences:" *foot* rather broad and truncated in front, without the usual ear-shaped points at the corners, becoming a little constricted behind, and having a very rounded extremity: *opercular lobe* simple. (Clark.)

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* Divided crosswise.

SHELL conic-oblong with a rather narrow base, thinnish, semitransparent and somewhat glossy: *sculpture*, rather strong longitudinal ribs, which are flexuous on the body-whorl and extend to the base, and are curved on the next two whorls, the upper ones being smooth; there are about 25 ribs on the last whorl, 20 on the penultimate, and 15 on part of the antepenultimate whorl, where the ribs cease altogether; the interstices of these ribs are crossed by finer and thread-like spiral or transverse striæ, of which about a dozen may be counted on the body-whorl, 7 or 8 on the next, and 5 or 6 on the succeeding whorl; the striæ do not extend to the suture; the mutual intersection of the ribs and striæ gives a finely cancellated or reticulated appearance: *colour* whitish: *spire* produced, slightly turreted; nucleus raised in front or on one side, and twisted inwards: *whorls* 4 (besides those forming the nucleus), convex, and rather quickly enlarging; the last occupies nearly three-fifths of the shell: *suture* deep and channelled, somewhat oblique: *mouth* oval, scarcely contracted above or expanded below; its length is almost two-fifths of the whole spire: *outer lip* not much curved, abruptly inflected on the periphery: *inner lip* thin on the upper part, continuous with the outer lip in adult specimens, thickened, reflected, and inclining to straight on the lower part, which is twice as long as the other: *umbilicus* slight, forming a narrow chink behind the inner or pillar-lip: *tooth* very retired and inconspicuous, consisting of a narrow oblique fold, which on breaking the shell may be seen winding round the pillar: *operculum* rather thin and delicately striated. L. 0·125. B. 0·05.

HABITAT: Coralline zone on the coasts of Devon and Cornwall (Montagu, Barlee, and others); Guernsey, Barmouth, Bantry Bay, co. Antrim, Oban, and Shetland (J. G. J.); Dublin Bay (Turton and Kinahan); co. Galway (Barlee); Clyde district, in nullipore (Norman); and Moray Firth (Gordon). Not uncommon. Coralline Crag at Sutton (S. Wood). Département of Morbihan (Taslé).

The exquisite latticework of this shell is more than worthy of the following lines attributed to Bishop Mant:—

> "These by the microscopic glass
> Survey'd, you'll see how far surpass
> The works of nature, in design
> And texture delicately fine,
> And perfectness of every part,
> Each effort of mimetic art."

Perhaps Adams's description of *Turbo pellucidus,* to which I formerly referred the present species, may be too vague for identification: it is, "T. quinque anfractibus reticulatis, apertura subrotunda. Obs. Color albus." It would suit as well a bleached *Rissoa punctura.* Our shell is the *Helix arenaria* of Maton and Rackett; and it is possibly, but little more than guessingly, Brown's *Pyramis spirolinus.* If the 'Illustrations of the Recent Conchology of Great Britain and Ireland' had been written in the seventeenth century, some allowance might be made for the abundance of its errors, both of graphic and pictorial delineation; but it is of modern date. The task of scrutinizing this author's numerous ill-defined and often questionable species, and the mental torture caused by hammering at the horrible names which he invented, are enough to give any one not having nerves of catgut a most excruciating headache. His stilted and often ungrammatical language, too, hardly suits the present age; "his words are a very fantastical banquet, just so many strange dishes." Why could he not say grooved instead of "sulcated," lengthwise and not "longitudinally," and for "undulated" wavy? and how do the whorls (or "volutions," as he calls them) "oblique towards the suture?"

B. *Turbonilla* or *Chemnitzia*.

21. O. CLATHRA'TA *, Jeffreys.

O. clathrata, Jeffr. in Ann. & Mag. N. H. 2nd ser. ii. p. 345; F. & H. iii. p. 258, pl. xciv. f. 4.

SHELL cylindro-conical, solid, opaque, and not so glossy as most of its congeners: *sculpture*, somewhat flexuous, strong and flattened longitudinal ribs, of which there are about 20 on the body-whorl, extending to the base; their interstices are of the same breadth as the ribs, and crossed by short transverse striæ or much smaller ribs, of which there are 3 rows on the last whorl, and 2 on each of the upper whorls: these transverse striæ occupy the middle or greater part of the last whorl and the lower half of each of the other whorls; the topmost or apical whorl is smooth: *colour* white, in one specimen stained with pale reddish-brown: *spire* elongated and tapering to an abruptly pointed extremity; nucleus raised on one side and twisted inwards: *whorls* 6–7, evenly convex; the last occupies more than two-fifths of the shell: *suture* rather wide and deep, somewhat oblique: *mouth* roundish-oval, or regularly oval, very little contracted above or expanded below; length about one-fourth of the whole spire: *outer lip* rounded, sharply inflected below the periphery: *inner lip* retreating obliquely (but not very thin) on the upper part, where it is united with the outer lip, so as to form a nearly complete peristome, scarcely reflected and gently curved on the lower part: *umbilicus* developed more than in the allied species, and consisting of a narrow depression and chink behind the pillar-lip: *tooth* or fold none. L. 0·165. B. 0·05.

HABITAT: Birterbuy Bay, co. Galway, where Mr. Barlee and I found two specimens by dredging in about 15 f. Hanley procured it at Malta, I at Spezzia, and M'Andrew at Orotava. It is evidently very rare.

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* Latticed.

Although I have only seen very few examples of this species, they all agree in shape, texture, sculpture, and other characteristics. It is intermediate between *O. decussata* and *O. indistincta*, but has perhaps a greater affinity to the latter. From *O. decussata* it differs in having a more elongated spire, much fewer, stronger, and more prominent longitudinal ribs, with short transverse interstitial striæ, which are confined to part of each whorl, instead of the whole surface being finely reticulated: from *O. indistincta* it may be known by its more conical and less cylindrical outline, and being proportionally broader, having the apex of the spire obliquely pointed instead of abruptly truncated, the whorls more convex, and the suture larger; the longitudinal ribs are thicker, broader, and flattened; and there are but three rows of spiral striæ on the body-whorl, and two on each of the upper whorls. It is also a more solid shell than either of the above-named species.

22. O. INDISTINCTA*, Montagu.

Turbo indistinctus, Mont. Test. Br. Suppl. p. 129. *Chemnitzia indistincta*, F. & H. iii. p. 255, pl. xciv. f. 2, 3.

BODY nearly clear white, with a pale yellowish tinge, overspread or powdered with minute snow-white flakes or lemon-coloured points: *snout* long, rather narrow, with a rounded extremity; it is somewhat grooved on its upper surface as far as the tentacular veil, where the slit for the issue of the proboscis is marked by a slight prominence: *tentacles* very short, united at the bases; their thin edges are unrolled on the march, which gives them a very large subtriangular, broad, leafy aspect, instead of the usual ear-shaped figure; tips large and inflated: *eyes* very black, conspicuous, and close together: *foot* large, long and extensile, thin, nearly transparent, either truncated or concave in front (depending on the will or action of the animal), with very large auricles, which in progression are used as feelers; the edges are often folded inwards; it ends in a needle-point: *opercular lobe* simple and obscure. (Clark.)

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* Obscure (metonymically).

Shell cylindrical and slender, rather thin, semitransparent and glossy: *sculpture*, numerous and close-set fine longitudinal ribs, which are flexuous on the body-whorl, curved on the middle ones, and oblique on those near the apex; they disappear towards the base; their interstices in nearly the lower half of each whorl are crossed by extremely short transverse or spiral striæ, of which there are from 6 to 8 rows on the last whorl, 3 or 4 on the middle whorls, and 2 only on each of the top whorls; in worn specimens the decussation thus produced gives a punctured appearance; the base exhibits microscopic spiral lines, and the apex is quite smooth: *colour* white: *spire* considerably elongated, and gradually tapering to an abruptly truncated extremity; nucleus twisted inwards: *whorls* 7–8, convex, depressed below the suture and also on the upper part of the spire; they shelve abruptly downwards towards the suture on the lower side; each has the usual thickened rim immediately below the suture; the last occupies about two-fifths of the shell: *suture* narrow and deep, nearly straight on the upper part of the spire, becoming somewhat oblique on the lower part: *mouth* oval, contracted above and considerably expanded below; length not one-fourth of the whole spire: *outer lip* flexuous, retreating and forming a sinus above, incurved below the periphery: *inner lip* extremely thin on the upper part, reflected and nearly straight below: *umbilicus* consisting of a slight depression which ends in a small narrow chink: *tooth* or fold none: *operculum* having a thin flap, and obliquely striated. L. 0·165. B. 0·04.

Var. *brevior.* Proportionally smaller, with a shorter spire and more convex whorls.

Habitat: Various places from Guernsey to Shetland, in from 4 to 40 f.; "not uncommon alive in rock-pools" at Cumbrae (Norman). The variety is equally distributed, and, according to Mr. Clark (who erroneously considered it *O. clathrata*), it inhabits "a peculiar district of shelly mud, between the laminarian and coralline zones in 10 fathoms water, off Teignmouth." Sars has recorded this species as occurring in a post-glacial shell-bank at

Kirkoën in Norway, at a height of 50 feet above the level of the sea; and Searles Wood gives it as a Coralline Crag fossil. It has been taken in a living or recent state by Sars in Christianiafiord, in 10–50 f., by Malm in 12 f. on the coast of Bohuslän, by Cailliaud in the Département of Loire-Inférieure, by M'Andrew off Gibraltar and in the Mediterranean, by Martin in the Gulf of Lyons, by me at Spezzia, by Acton (on the authority of Dr. Tiberi) at Naples, by Tiberi at Magnisi in Sicily (of a much smaller size than usual), and by M'Andrew among the Canary Isles, in 40–60 f.

The synonyms are *Turritella truncata* of Fleming, *Rissoa Balliæ* of Thompson, *Terebra speciosa* of Bean (from a broken specimen), and *Chemnitzia curvicostata* of Searles Wood.

23. O. INTERSTINC'TA*, Montagu.

Turbo interstinctus, Mont. Test. Br. (ii.) p. 324, t. 12. f. 10. *O. interstincta*, F. & H. iii. p. 296, pl. xcvii. f. 1.

BODY white and transparent: *snout* small, narrow and slender: *tentacles* varying in length, rather broad, with a small white bulb on each at the tip; they are retractile, as in *Rissoa*: *eyes* small, rather close together, at the inner base of the tentacles, sometimes withdrawn under the shell when the animal is crawling: *foot* short and narrowish, truncated or slightly indented in front, with small auricles, behind which it is constricted for about one-third of its length; tail bluntly pointed.

SHELL conic-oblong, rather solid, semitransparent and glossy: *sculpture*, numerous strong and slightly curved longitudinal ribs, broader than the interstices, about 20 on the body-whorl; these are cut off at the periphery by two (very rarely three) rows of obscure spiral striæ, which are placed close together below the periphery, and cross the interstices of the ribs in such a manner as to form oval cavities or punctures having their greater axis in the direction of the spire; each of the upper whorls is similarly marked just above the suture; the base of the shell is almost always smooth: *colour* white: *spire* more or less elongated, and tapering to a blunt extremity; nucleus smooth, higher on one side and twisted inwards: *whorls* 5–6, compressed rather than convex, shelving abruptly towards the suture, each having a thickened rim round the top; the last occupies more than one-half of the shell: *suture* narrow, but deeply excavated, scarcely oblique: *mouth* oval, somewhat contracted above and much expanded below; its length equals, and in some cases exceeds, one-third of the whole spire: *outer lip* flexuous, slightly sinuated above, where it is gently incurved on the periphery: *inner lip* undistinguishable and apparently wanting on the upper part, not much reflected (although sloping inwards) and nearly straight below, terminating in a rectangular base, like *O. unidentata*: *umbilicus* none, or consisting at the most of an indistinct and narrow chink, which, however, becomes considerably developed in aged specimens: *tooth* short and retired, but strong: *operculum* flexible, with a very thin flap, closely and finely striated in the line of growth, and presenting the usual triangular ridge on the pillar-side and a minute almost terminal spire. L. 0·125. B. 0·04.

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* Punctured here and there.

Var. 1. *terebellum.* Much larger, with an elongated spire; ribs set more obliquely, especially on the body-whorl; tooth prominent. *Chemnitzia terebellum*, Philippi, Moll. Sic. ii. p. 138, t. xxiv. f. 12.

Var. 2. *suturalis.* Much smaller, more cylindrical and narrower; ribs finer, decidedly curved, or even flexuous, on the body-whorl, and occasionally covering the base. *Rissoa striata* (afterwards changed to *R. suturalis*), Phil. *l. c.* i. p. 154, t. x. f. 8.

Habitat: Everywhere, in the laminarian and coralline zones; nestling among stones and old shells, and occasionally at the base of seaweeds in rock-pools at spring tides. Post-glacial shell-banks in Norway, 0–100 feet (Sars). Extensively distributed over the North Atlantic and Mediterranean, from the Loffoden Isles, 10–50 f. (Sars), and Bohuslän, 10–20 f. (Malm), along the north coast of France (De Gerville and others), to Spezzia (J. G. J.), at depths varying from 3 to 20 f.

Var. 1. Oxwich Bay near Swansea, and Cork Harbour (J. G. J.). Fossil at Palermo (Philippi). Living in Norway (Lovén), Denmark (mus. Copenh.), Loire-Inférieure (Cailliaud), Arcachon (Fischer, as *O. Moulinsiana*), Gulf of Lyons (Martin), Antibes (Macé), and in sand from Rimini (J. G. J.). Var. 2. Many parts of our coasts, from Shetland to Guernsey, in the coralline zone. Searles Wood has described and figured the latter variety from the Coralline Crag as *O. pupa* of Dubois. This is not uncommon in the Mediterranean, and M'Andrew has dredged it off Orotava. It is the *O. oblonga* of Macgillivray.

This species cannot be well mistaken for *O. indistincta* (although the two names are inconveniently similar), if their shape and sculpture be compared; the other species has, moreover, a truncated apex and is never furnished with a tooth. In distorted examples of the present species from Guernsey and co. Antrim the base is contracted, causing an expansion of the outer lip and a deep umbilicus.

The following description of Adams's *Turbo interstinctus* (Linn. Trans. 1795) evidently does not apply to *O. interstincta*:—"T. testa lævi, quinque anfractibus costa tenui interstinctis. Obs. Color albus, apertura subrotunda." Our shell is not smooth, nor are the whorls divided by a slight rib; and the mouth is not roundish. That description may have been taken from a worn specimen of *Rissoa semistriata*. The present species is much more likely to have been his *Turbo canaliculatus*. It is also apparently *Rissoa Deshayesiana* of Récluz, whose collection I unfortunately have not yet, in accordance with his kind promise, had the privilege of seeing. Brown's *Pyramis Lamarckii, P. lacteus,* and *Jaminia obtusa,* and Leach's *Turbonella Montaguana* may also be referred to the same category of probable synonyms. The variety *terebellum* agrees with Requien's too succinct notice of *Chemnitzia perlata.*

24. O. SPIRALIS*, Montagu.

Turbo spiralis, Mont. Test. Br. (ii.) p. 323, t. 12. f. 9. *O. spiralis*, F. & H. iii. p. 299, pl. xcvii. f. 2, and (animal) pl. FF. f. 8, 9.

BODY clear white, delicately suffused with snow-white points of different sizes [white (Lovén), sulphur-yellow (F. & H.)]: *snout* of moderate length [narrow and entire (Lovén)], flattened, and rounded in front, extending from the tentacular membrane beyond the foot: *tentacles* united at the base in front and widely diverging, short, flat and broad, "setose" [?], with a snow-white line from base to point and a round flake-white dot at each of their tips: *eyes* large and black [near each other (Lovén)], placed behind the fork of the tentacles, on their internal angles: *foot* rather broad, slightly auricled, and sinuated on each side; sole slightly grooved lengthwise in the middle [notched in front (Lovén)]; tail rounded when the animal is at rest or at half stretch, and bluntly pointed in full march. (Clark.)

SHELL conic-oval, inclining to oblong, with a wide base which is somewhat angulated, rather solid, semitransparent and glossy: *sculpture*, numerous strong and straight or slightly curved longitudinal ribs, broader than the interstices, about 30 on the body-whorl; they are cut off at the periphery by the first of a series of spiral striæ that revolve round the base and are in number from 6 to 8; these striæ are often closely punctured, owing to a decussation in that part by longitudinal ribs which have otherwise disappeared, and they become less distinct as they approach the base; the apex of the shell is quite smooth: *colour* white: *spire* pyramidal, and ending in a blunt point; nucleus obliquely twisted inwards: *whorls* 5–6, convex but flattened, rapidly enlarging, and abruptly shelving towards the suture; the last occupies about three-fifths of the shell: *suture* narrow and deeply excavated, nearly straight: *mouth* irregularly rhomboidal, forming an acute angle above and considerably expanded below; its length equals two-fifths of the whole spire: *outer lip* sinuous, contracted on the upper part, sloping upwards to the under side of the periphery: *inner*

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* Wreathed.

lip more or less distinct on the upper part of the pillar, according to the degree of maturity of the specimen, in other respects like *O. interstincta*, but not so straight on the lower part as in that shell, and terminating in an obtuse angle: *umbilicus* consisting of a more conspicuous chink than in the last-named species: *tooth* very short, blunt and obscure, being seated far within the pillar: *operculum* as in *O. interstincta*; the inner side is slightly notched to receive the tooth. L. 0·125. B. 0·05.

Habitat: Equally distributed with the last species, and inhabiting the same zones. Fossil: Dalmuir (Robertson and Crosskey); glacial and post-glacial shell-banks in Norway, the former at 400–460 feet, and the latter at 50–100 feet (Sars). Recent: Norway, as far north as Öxfjord in Finmark, 10–40 f. (Sars); Sweden, 10–17 f. (Lovén and Malm); Cattegat (mus. Copenh.); Loire-Inférieure, among *Corallina officinalis* (Cailliaud); Rochelle (D'Orbigny père); off Gibraltar, 8–30 f. (M'Andrew).

Specimens in my collection from Shetland are covered with *Discorbina globularis.* Some are distorted in the same way as those which I noticed when treating of *O. interstincta.* The striæ which encircle the base of the shell distinguish the present from any other species.

It is the *Voluta pellucida* of Dillwyn. A worn specimen was described by Macgillivray as *O. plicata.*

25. O. exi'mia*, Jeffreys.

Rissoa eximia, Jeffr. in Ann. & Mag. N. H. new ser. iv. p. 299. *Chemnitzia eximia*, F. & H. app. p. 278, pl. xc. f. 1 (as *R. eximia*).

Shell oblong, rather solid, semitransparent and glossy: *sculpture*, fine curved longitudinal ribs, which do not reach the base; 15 or 16 of them may be counted on the last whorl; these (or more frequently their interstices) are crossed by 3 spiral striæ or finer ribs, which traverse the middle of this whorl, and give a partially cancellated appearance to the shell; the next whorl has 2 or 3 similar striæ near the base, the lowermost being partly concealed by the suture; the succeeding whorl exhibits 2 striæ only; the top whorl is smooth: *colour* white: *spire* tapering to a rounded point; nucleus globular, and twisted inwards in various directions: *whorls* 4–5, very convex and almost tumid, gradually enlarging; the last occupies more than half the shell: *suture* very deep, and nearly straight: *mouth* proportionally small, oval, expanded below; its length scarcely equals one-third of the whole spire: *outer lip* rounded, recurved on the lowermost spiral stria: *inner lip* nearly indistinct on the upper part, gently curved and slightly reflected below, and terminating at the base in an obtuse-angled point: *umbilicus* extremely small and narrow, but distinct: *tooth* minute, somewhat retired, and obscure. L. 0·06. B. 0·03.

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* Uncommon.

Habitat: The deep-water zone in east Shetland from 60° to 61° N. lat.; also in the Minch, off Loch Ewe, Ross-shire, in 60 f. (J. G. J.).

This minute shell, not much larger than *O. minima*, was discovered by Mr. Barlee. I have never found living specimens, although some had evidently not long been vacated by the animal. Sars has recorded this remarkable species as fossil in post-glacial shell-banks near Skien in the Christiania district, at a height of 100 feet, and as living at Öxfjord, Bergen, and Christianiafiord; Lilljeborg also dredged it at Bergen, and obligingly gave me a specimen for comparison.

Clark described it as *Chemnitzia Barleei*—a well-deserved compliment to the discoverer, but an unnecessary synonym. *Turbonilla eximia* of A. Adams, one of his recent discoveries in Japanese waters, is not the present species.

26. O. fenestra'ta*, Forbes.

O. fenestrata, (Forbes) Jeffr. in Ann. & Mag. N. H. 2nd ser. ii. p. 345.
Chemnitzia fenestrata, F. & H. iii. p. 249, pl. xciii. f. 6, 7.

Body nearly clear white, with a frosted aspect; the neck is marked on each side, as far as the tentacles, with a pale lead-coloured stripe of unequal breadth, which is composed of very minute points so as to give the stripes a mottled look; a tinge of the same colour pervades the basal portion of the tentacles and upper surface of the foot: *mantle* having a small offset at the upper angle: *snout* long and slender, greatly thickened at its base, and much compressed towards the other extremity, which is slightly funnel-shaped: *tentacles* comparatively long and slender, united at the bases, and having very distinct white inflated tips: *eyes* conspicuous, close together, and imbedded at the inner angles of the tentacles: *foot* in slow march short, broad and obtuse; but when the pace is accelerated it becomes attenuated and extends to the bottom of the penultimate whorl; it makes in front a concave sweep, ending on the right and left in very slight ear-shaped points; it has a somewhat lanceolate shape behind. (Clark.)

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* Covered with latticework, like a window.

Shell forming an elongated pyramid, rather solid, almost opaque, glossy: *sculpture,* numerous fine and oblique or sometimes flexuous longitudinal ribs which do not reach to the base; the last whorl has about 20 of these ribs; they are interrupted at the periphery and crossed by 3 prominent spiral ridges placed near together, which occupy the middle of the body-whorl, and there is also another but slighter spiral ridge (and occasionally a 5th, rudimentary one) below the periphery; the lower part of each of the upper whorls has 2 ridges; the points where the ridges cross the ribs are nodulous or tubercular; the top whorl is smooth: *colour* whitish: *spire* remarkably turreted, in consequence of each whorl being broader at the base than the upper part of the succeeding whorl, and appearing to overlap the suture in an imbricated manner; nucleus somewhat excentric and prominent, abruptly twisted inwards: *whorls* 8–9, compressed or shelving upwards towards the suture, and moderately convex on the lower part; the last occupies about one-third of the shell: *suture* deep and slightly oblique: *mouth* proportionally small, rhomboid-oval, contracted above, wide, slightly expanded, and decidedly angulated below; length scarcely exceeding one-sixth of the spire: *outer lip* gently rounded, recurved on the lowermost of the 3 main spiral ridges, by all of which it is notched or indented at the edge: *inner lip* forming on the upper part of the pillar a thin film which is united with the outer lip, on the lower part nearly straight and not much reflected, terminating in a rectangular point: *umbilicus* wanting, or now and then represented by a minute and narrow chink: *tooth* or fold none in any of the specimens (more than 50) which I have examined: *operculum* thin, exquisitely and closely striated in the line of growth. L. 0·15. B. 0·05.

HABITAT: Muddy ground, in 7–12 f., Dartmouth (M'Andrew and Forbes), Southampton (M'Andrew), Exmouth (Clark and Barlee), Torbay (Hanley and others), Fowey (Barlee), Falmouth (Hockin), St. Catherine's Bay, Jersey (Norman). Loire-Inférieure (Cailliaud); Vigo Bay, 4 f. (M'Andrew); Spezzia (Marquis J. Doria and J. G. J.); in sand from Rimini, nearly 40 years ago (J. G. J.); Algiers (Weinkauff).

A specimen which I dredged in Torbay exemplifies the mode of growth under accidental conditions. It had been broken; and a new outer whorl smaller than the preceding one was added, followed by another which increased in size at the usual rate; so that the shell had the appearance of being double, one placed above the other. The egg-capsule is semiglobular, attached by its round and broad base, membranous and thin; when the fry are developed, they find their way out through an oval hole in the centre of the upper part, which then becomes enlarged from what was at first a narrow slit.

This is the *Turbonilla Weinkauffi* of Professor Dunker. *Parthenia fenestrata*, lately described by Mr. Arthur Adams, from Japan, is a different species; such duplicate names must be changed.

27. O. EXCAVA'TA*, Philippi.

Rissoa excavata, Phil. Moll. Sic. i. p. 154, t. x. f. 6. *O. excavata*, F. & H. iii. p. 305, pl. xcvii. f. 3, 4.

SHELL pyramidal, solid, opaque, rather glossy: *sculpture*, prominent spiral ridges, of which there are 3 on the main part of the body-whorl, and 2 short ones on the base, the last being close behind the pillar-lip; the 3 principal ridges are equidistant, one just below the suture, another in the middle, and the lowermost encircling the periphery; each of the other whorls has 2 similar ridges, representing the upper two of the body-whorl; all the ridges are crossed obliquely by sharp and raised longitudinal ribs, which extend to the base and impart a strongly and deeply cancellated appearance, the points of intersection being nodulous or tubercular; of the longitudinal ribs about 25 may be counted on the last whorl of a full-grown individual; the top whorl is smooth: *colour* white: *spire* tapering to a bluntly rounded point; nucleus somewhat excentric, and twisted inwards: *whorls* 6, turreted, flattened (except for the angularity caused by the excavated sculpture), and gradually enlarging; the last occupies rather more than half the shell: *suture* broad and remarkably deep, slightly oblique: *mouth* squarish-oval, not contracted above, expanded and angulated below; length about one-third of the spire: *outer lip* projecting, marked by four angular points, being the terminations of the spiral ridges; it is abruptly recurved on the peripheral ridge: *inner lip* slight on the upper part, but united with the outer lip, reflected and almost straight below, where it also joins the outer lip at a right angle: *umbilicus* narrow and contracted, but distinct: *tooth* small and retired, although visible in every specimen, and winding round the pillar. L. 0·15. B. 0·06.

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* Hollowed out.

HABITAT: Coralline zone in Jersey (Dodd), Guernsey (Metcalfe, Barlee, and J. G. J.), Falmouth (Hockin), Fowey and Burrow Island (Barlee), Exmouth (Clark), Miltown-Malbay, co. Clare (Harvey and Humphreys), Turbot-bank, off Larne (Waller), Lamlash Bay, N.B. (Landsborough, Bean, and Norman). Cailliaud has taken it, among *Corallina officinalis*, in the Département of Loire-Inférieure, Gay at Toulon, Macé at Cannes and Antibes, the Marquis J. Doria and myself at Spezzia, von Schröckinger and Brusina in the Adriatic, Philippi in Sicily, and Weinkauff at Algiers in 5–20 f. Mediterranean specimens are much smaller than ours.

Professor Harvey, the discoverer of this species on our coasts, proposed to call it *Cingula sculpta*; Mr. Thompson of Belfast described it as *Rissoa Harveyi*; and in Mr. Hanley's 'British Marine Conchology' it bears the name of *Parthenia turrita*, Metcalfe, MS.

28. O. SCALA'RIS*, Philippi.

Melania (afterwards *Chemnitzia*) *scalaris*, Phil. Moll. Sic. i. p. 157, t. ix. f. 9. *C. scalaris*, F. & H. iii. p. 251, pl. xciv. f. 5, and (animal) pl. FF. f. 5.

Body nearly clear frosted-white, or pale red-brown [of a brownish-madder hue (F. & H.)]: *mantle* having a small cloven fold at the upper angle of the mouth of the shell: *snout* deeply notched in front, with the segments gently curved: *tentacles* rather long, strong, and divergent; they do not quite coalesce at their bases, being separated by a distinct groove which is the continuation of one on the snout from the point where the notch ceases; terminal bulbs not much developed: *eyes* black, not very close together: *foot* short, slightly auricled, and bluntly pointed behind. (Clark.)

Shell forming a very elongated cone, moderately solid, opaque, rather glossy: *sculpture*, numerous laminar longitudinal ribs, varying in number from 25 to 30 on the body-whorl; they are sometimes nearly straight, at other times set obliquely, or curved, occasionally flexuous, and they seldom extend to the base; their interstices are crossed by fine and more close-set spiral striæ, which are often arranged in pairs and cover the base; no cancellation is produced, because the ribs are always more prominent than the striæ; the top whorl is, as usual, smooth: *colour* pale-yellowish or creamy, with frequently 2 or 3 faint tawny bands round the last whorl (one broader in the middle, another below the periphery, and sometimes a third under the suture); the preceding whorls have only the upper band or that and the middle one: *spire* tapering somewhat abruptly to a rounded point, which forms the nucleus or crown; this is remarkably prominent, and, although twisted inwards, it exposes nearly the whole of the reversed portion of the spire: *whorls* 8 (exclusive of the nucleus), turreted, convex but compressed, and gradually enlarging; the last occupies about two-fifths of the shell: *suture* deep, slightly oblique: *mouth* irregularly rhomboidal, owing to the angular shape of the pillar-side; it is somewhat contracted above and expanded below; length about a fourth of the spire: *outer lip* rounded, not much projecting, incurved a little below the periphery: *inner lip* adhering to the upper slope of the pillar (although scarcely perceptible), straight below, and slightly reflected towards the base, where it shelves inwards: *umbilicus* or *tooth* none: *oper-*

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* Resembling a flight of steps.

culum thin and flexible, irregularly striated; spire extremely short, minute and terminal. L. 0·25. B. 0·085.

Var. *rufescens*. Body white, slightly tinged with brown: *snout* rather narrow and bilobed: *tentacles* longish, lanceolate, and set well apart: *eyes* placed almost centrally at the bases of the tentacles: *foot* oblong, lanceolate, obtusely angled in front, triangular behind. (F. & H.) Shell longer in proportion to its breadth, and thinner, having the whorls more convex and the ribs crowded and slighter, so as to give a less turreted appearance; colour more uniformly tawny, with darker bands. *Chemnitzia rufescens*, (Forbes) F. & H. iii. p. 253, pl. xciv. f. 1, and (animal) pl. FF. f. 6.

Habitat: Coralline zone, Guernsey (Hanley, Barlee, and J. G. J.), Land's End (Hockin), Dartmouth (M'Andrew), Torquay (Battersby), Exmouth (Clark), Tenby (Lyons), Milford Haven (Forbes and M'Andrew), Goodwick Bay, Pembrokeshire (J. G. J.), Dublin coast (Ball and Warren, *fide* Thompson, as *Eulima Jeffreysii*). Its foreign distribution extends from Cherbourg (Macé) to Vigo Bay and Gibraltar (M'Andrew), and throughout the Mediterranean, to the Ægean, at depths varying from 8 to 35 f. The variety has a more northern habitat, viz. Lough Strangford (Dickie), co. Antrim (Hyndman, Waller, and J. G. J.), Aberdeenshire (Macgillivray and Dawson), west coast of Scotland, and Shetland. A specimen of this variety is in Mr. Searles Wood's collection of Crag fossils in the British Museum. Sars has dredged it in Finmark, Danielssen and others in the lower parts of Norway, Lovén and Malm in Bohuslän, Totten and Professor Adams in Massachusetts, and Stimpson in New England. These give a bathymetrical range of 20–60 f. for the European, and 3 f. for the last-named American locality.

One of my specimens in Mr. Clark's collection from Exmouth has the sculpture of the body-whorl the same as that of the variety, while the sculpture of the rest of the shell is as usual in the typical form. The Milford specimens appear also to be intermediate.

The variety is the *Turritella indistincta* of Fleming, *T. interrupta* of Totten, and *Eulima decussata* of Macgillivray.

29. O. RUFA*, Philippi.

Melania (afterwards *Chemnitzia*) *rufa*, Phil. Moll. Sic. i. p. 156, t. ix. f. 7.
C. rufa, F. & H. iii. p. 245, pl. xciii. f. 4.

BODY of a clear pale-azure colour, irregularly aspersed with snow-white flakes: *snout* extending from the conjoined tentacular membrane to a little beyond the foot, and forming a sort of head-veil; it is long, flat, and bilobed: *tentacles* short, broad, very little folded, and diverging; tips rounded: *eyes* placed on the inner bases of the tentacles: *foot* large, moderately long, auricled in front, tapering behind to a point when at full stretch, but rounded when at rest. (Clark.)

SHELL forming an attenuated cone, moderately solid, opaque, and glossy: *sculpture*, narrow and shallow longitudinal ribs, from 20 to 30 on the body-whorl; they are nearly straight, and never reach the base, being sharper and more distinct on the upper whorls; their interstices are crossed, and the base encircled, by rather broad impressed lines, of which there are from 8 to 10 below the periphery, and 4 to 6 above it; these lines, when magnified, appear double, or sometimes composed of several threads; the whole surface is covered with microscopic and close-set striæ in the line of growth; nucleus quite smooth: *colour* pale-fawn or tawny, with frequently a narrow reddish-brown or orange band round the middle of each whorl: *spire* greatly elongated, tapering to a rounded point which forms the nucleus; this is remarkably prominent and exposes the reversed and compact spire of the embryo, which bends downwards on the first regular whorl in various directions: *whorls* 10–13 (exclusive of the nucleus), convex although more or less compressed, and gradually enlarging; the last occupies from a third to a fourth of the shell: *suture* narrow and deep, slightly oblique: *mouth* irregularly rhomboidal, acute-angled above and expanded below; length from a fifth to a sixth of the spire: *outer lip* somewhat contracted, very little incurved below the periphery: *inner lip* forming a thin film on the upper slope of the pillar, slightly reflected and nearly straight below: *umbilicus* none, except a slight depression of the base in adult specimens: *tooth* very retired, slight, and indistinct, formed on the pillar near its junction with the upper slope of the base: *operculum* as in the last species. L. 0·35. B. 0·1.

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* Reddish.

Var. *fulvocincta*. Body whitish: *snout* long and bilobed: *tentacles* leaf-like, rather short and broad, set well apart: *eyes* small, sessile on the inner bases of the tentacles: *foot* squarish in front, with small angular corners, and pointed behind. Shell more slender than the typical form, with a narrower base, and of a thinner texture: *colour* whitish, the band being always present and more conspicuous: *whorls* not so much compressed. *Turritella fulvocincta*, Thompson in Ann. & Mag. N. H. v. p. 98. *Chemnitzia fulvocincta*, F. & H. app. p. 276, pl. xciii. f. 3, and (animal) pl. FF. f. 4, as *C. rufa*.

Habitat: Coasts of Cornwall, Devon, and Dorset, in trawl-refuse and at comparatively small depths; Langland and Oxwich Bays near Swansea, in 15 f., and Fishguard in 8 f. (J. G. J.); Tenby (Lyons); Anglesea (M'Andrew). A local or rare species. Coralline Crag at Sutton, according to S. Wood; but his specimens appear to belong to a different and probably an extinct species. It has an extensive range southward, along the Atlantic coasts of France, Spain, Portugal, Madeira, and the Canary Isles, and also throughout the Mediterranean and Adriatic, at depths of from 8 to 30 f. The variety occurs on our northern, Scotch, and Shetland coasts, from the Dogger bank to Unst, at various depths from 30 to 90 f., and in the north, east, and south of Ireland. Sars has recorded it as fossil from a post-glacial shell-bank at Skien, 70–80 feet above the sea; he and many other Scandinavian naturalists have enumerated the same variety as living in Sweden and Norway, at depths of from 20 to 60 f.

My largest specimen, which is from Exmouth, measures half an inch in length; and a fragment of another (from Shetland) represents even a larger size. I regard the typical form as southern or inhabiting shallower water, and the variety as northern or inhabiting greater depths.

This may be the *Turbo simillimus* of Montagu, which he described from a specimen (probably a bleached and worn one) said to have been found by Laskey on the shores of Jura—although he omitted to notice the interstitial striæ. It is the *Pyramis crenatus* of Brown, *Chemnitzia fasciata* of Requien, and *Turritella Danmoniensis* of Leach, whose *Turbonella Hibernica* may be the variety.

With respect to the species described by me in the 'Annals and Magazine of Natural History' (ser. 2. ii. p. 347) as *O. formosa,* and well figured by Forbes and Hanley (pl. xciii. f. 5) as *Chemnitzia formosa,* I am bound to say that I am not satisfied about the origin of the specimen on which the description and figure were founded. I received it from the late Mr. G. B. Sowerby as having been collected at Shellness in Kent; but I suspect that he was misinformed, and that the shell is exotic. The other specimens which I referred to this species are *O. rufa,* var. *fulvocincta. O. formosa* is certainly distinct, however, from any other known species; it is remarkably slender, with flattened whorls and a deeply channelled suture, which makes the spire appear scalariform.

30. O. LAC'TEA*, Linné.

Turbo lacteus, Linn. S. N. p. 1238. *Chemnitzia elegantissima,* F. & H. iii. p. 242, pl. xciii. f. 1, 2.

BODY clear white: *mantle* even, with hardly a trace of the usual branchial fold: *snout* or upper flap-skin (mentum) deeply grooved in the middle on the upper surface, and entire at the extremity, which is rounded when at rest, and apparently truncated when carried before the foot on the march: *tentacles* short, very bluntly pointed and leaf-like, having large and extremely flexible lateral membranes which coalesce for half their height, and are capable of instantaneously assuming various shapes: *eyes* at a little distance from the internal line of the tentacular bases: *foot* truncated in front, very slightly auricled, narrow, not very long, attenuated and tapering behind to a rounded broad termination: *opercular lobe* obscure. (Clark.)

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* Milk-white.

Shell forming a greatly elongated cone, rather solid, nearly opaque, and glossy: *sculpture*, strong, narrow, and close-set longitudinal ribs, from 20 to 25 on the last whorl; they are more or less curved or flexuous, and placed obliquely, and they terminate abruptly a little below the periphery, the base being perfectly smooth; although no other sculpture is visible with a low magnifying-power, the whole surface of a live specimen exhibits under the microscope extremely numerous spiral lines; the first whorl is glabrous: *colour* milk-white, with a slight bluish tinge in live specimens: *spire* tapering to a rounded point; embryonic nucleus as in the last species: *whorls* 12 (exclusive of the nucleus), moderately convex, and gradually enlarging; the last occupies from a fourth to a third of the shell: *suture* narrow and deep, slightly oblique: *mouth* irregularly rhomboidal, longer and more expanded at the base than in *O. rufa*, but similar in all other respects: *outer lip* gently rounded, except under the periphery, where it is very slightly incurved and shelves outwards: *inner lip* forming a thin glazing or layer on the upper slope of the pillar, very little reflected and nearly straight below, where it is more extended than in the last species: *umbilicus* none: *tooth* usually wanting; but in some specimens an obscure tubercle may be detected on the upper part of the pillar, far within the mouth: *operculum* as in the last two species, sometimes slightly notched on the inner side to accommodate the tooth when present. L. 0·35. B. 0·1.

Var. *paullula*. Dwarfed and depauperated.

Habitat: English, Bristol, and St. George's Channels, all Ireland, and the west coast of Scotland, as far north as Loch Ewe; Aberdeen (Macgillivray); Dunbar (Laskey, *fide* Brown); Sandwich (Walker); Roach River, Essex (J. G. J.). A common but most elegant shell. It is found living at low-water mark of spring tides, and in the laminarian zone, as well as dredged without the animal in the coralline zone. Post-tertiary deposit in Sussex (Godwin-Austen); ? Norwich Crag (Wigham, *fide* S. P. Woodward); ? Coralline Crag (S. Wood); Italian tertiaries (Risso, as *Turbonilla plicatula,* and Philippi). The variety has occurred to me in several localities; this is far less slender or needle-shaped than the *Chemnitzia gracilis** of Philippi, for which I at one time mistook it. Beyond our shores the present species is widely distributed, from Tromsö in Finmark (Sars) to the Canary Isles (D'Orbigny and M'Andrew), and in every part of the Mediterranean and Adriatic; Ægean (Forbes). The Red Sea is given by Philippi, on the authority of Hemprich and Ehrenberg, but, it seems, erroneously. No mollusk is at present known to be common to the Red Sea and Mediterranean. The depths recorded by various authors range from the shore to 50 f.

One of my specimens, which wants the first 4 whorls, has no fewer than 12 left, and is nearly six-tenths of an inch long. Mr. Bretherton says, in the 'Zoologist' for 1858, that it will continue lively in the aquarium for at least a month.

There can surely be no valid reason why any well ascertained name, given by the "princeps naturæ curiosorum" (*πόδες δὴ κεῖθι τιμιώτατοι*) to a species described in his 'Systema Naturæ,' should sink into oblivion. In the present instance there is no ambiguity of definition, no question of identification, no risk of increasing the confusion which unfortunately pervades our scientific nomenclature. If the author, indeed, had been obscure or local, instead of cosmopolitan, I should have hesitated at adopting the name in preference to one subsequently proposed by some naturalist of equal reputation, but which was in general use. It is true that the restoration of ancient names, however accredited, may for a time cause some inconvenience, and oblige many to go to school again; but is not the latter a condition of scientific and even intellectual existence? Let us, therefore, not be too indolent, nor too selfish. Posterity has its claims; and I write (as every one does on a subject of natural history) not only for this generation, but for all those to succeed it. After Linné, this species was (although loosely) described and figured by Pennant as *Turbo albus,* by Donovan as *T. acutus,* by Adams as *T. subarcuatus,* by Montagu as *T. elegantissimus,* by Scacchi as *Rissoa turritella,* and by Philippi as *Melania Campanella.* Risso misquoted Montagu in describing his *Eulima elegantissima,* which appears to be our *E. polita.* A specimen having the ribs somewhat more oblique than usual was described by Leach as *Cerithium Spencerianum.*

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* Not *Turbo gracilis* of Brocchi, which is a miocene fossil, nor *C. gracilis* of De Koninck, which is palæozoic.

31. O. PUSIL'LA* Philippi.

Chemnitzia pusilla, Phil. Moll. Sic. ii. p. 224, t. xxviii. f. 21.

BODY differing from that of *O. lactea* in the following particulars:—the *snout* has a palish purple streak on either side; each of the *tentacles* is marked with a similar streak; when spread, they have the lateral membranes united almost to the tips, which are minute and acutely pointed, so that the tentacles then appear like a single united leaf; the *foot* is much longer, extending on the march to the last whorl but two, and terminating in almost a needle-point; whilst in the other species, under the same circumstances, it is quite rounded, and does not reach beyond the last or body-whorl. (Clark and Bretherton.)

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* Little.

Shell shorter and more cylindrical than *O. lactea*, being of nearly equal breadth throughout, instead of pyramidal and becoming gradually broader towards the base; it is also more solid; the ribs are always curved, but not set obliquely, and they do not terminate quite so abruptly below the periphery; the whorls, although equal in number, are more rounded and compact, those near the apex rapidly increasing, so as to give that part a quasi-truncated appearance; the base is usually more contracted; and the tooth (or rather the fold or plait) is frequently visible, just below the angle formed by the pillar with the upper slope of the base, and by breaking the shell this may be traced winding round the pillar. L. 0·275. B. 0·075.

Habitat: With the last species, but hitherto noticed as found only in the undermentioned places:—St. Catherine's Bay, Jersey (Norman); Guernsey, Lulworth, and Torbay (J. G. J.); Littleham Cove, Exmouth (Clark); Burrow Island (Barlee); Falmouth (Hockin); Barrycane, North Devon (Miss Jeffreys); and Ilfracombe (Alder). Loire-Inférieure, among *Zostera marina* (Cailliaud); Gibraltar (M'Andrew); Gulf of Lyons (Martin); Cannes (Macé); Spezzia (Marquis J. Doria and J. G. J.); Tarento (Philippi); and Algiers (Weinkauff).

According to Mr. Bretherton, this species creeps quickly over the sand at the bottom and along the sides in an aquarium, but very frequently falls off the slippery surface of the glass; the shell is dragged rather than borne. In comparing it with what Mr. Clark appropriately calls its stately congener (*O. lactea*), size is not the only distinctive mark. A specimen of the present species as large as an ordinary one of the other, presents all the peculiar characters which I have pointed out. In at least 100 specimens of each examined by me, not one occurred of an intermediate kind.

Chemnitzia pusilla of the late Professor Adams (1850), from Jamaica, is a different species.

C. *Eulimella.*

32. O. Scillæ*, Scacchi.

Melania Scillæ, Scacchi, Notizie int. alle Conch. p. 51, no. 147. *Eulimella Scillæ*, F. & H. iii. p. 309, pl. xcviii. f. 5, 6, and (animal) pl. FF. f. 7, as *Chemnitzia M'Andrei.*

Body milk-white, microscopically speckled with flake-white: *snout* gibbous in front, with an auricle or lobe on each side: *tentacles* short, often folded inwards like a young and undeveloped leaf, protruded horizontally: *eyes* small, black, placed close together behind the tentacles: *foot* long and broad, truncated in front, with rather acute angles or corners, abruptly ending behind in a minute point or tail.

Shell forming a greatly elongated cone with a comparatively broad base, rather solid, semitransparent and of a polished lustre: *sculpture* none, except lines of growth; the microscope, however, shows an infinite number of excessively minute and close-set spiral striæ, which permeate the tissue of the shell and are apparently connected with its structure: *colour*, that of glass in live specimens, becoming white in dead ones: *spire* tapering to a rounded point; nucleus exposed, twisted horizontally across the top of the first regular whorl, and resembling a young *Spirialis retroversus*: *whorls* 11–12 (exclusive of the nucleus), gradually enlarging, flattened (especially on the upper part), more or less angulated on the lower part and at the base of the shell, which is remarkably depressed and contracted inwards; the last whorl occupies about one-third of the shell: *suture* very narrow, slightly excavated, and nearly straight; it appears, like many of its congeners, edged by a darkish band on the upper part of each whorl, owing to the periphery of the preceding whorl being visible through the partial transparency of the shell: *mouth* irregularly rhomboidal, contracted above and expanded below; length between a fourth and a fifth of the spire: *outer lip* curved, except the upper side, which shelves gently outwards a little below the periphery: *inner lip*, a mere film on the upper slope of the base, somewhat reflected and straight below: *umbilicus* usually none, although the above-mentioned depression of the base sometimes produces a small central cavity: *tooth* obscure, in one specimen like that of *O. pusilla*. L. 0·35. B. 0·1.

Var. *compactilis*. Shell thinner, much smaller, and not so strongly keeled. L. 0·1. B. 0·03.

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* Dedicated to the memory of an Italian naturalist and poet of the 17th century.

Habitat: Muddy sand in 12–87 f., Shetland and west of Scotland; Aberdeenshire (Dawson); Whitburn (Abbes and Howse, *fide* Alder); Berwick Bay and off Coquet Island (Mennell); Larne, co. Antrim (Hyndman and Waller), perhaps from a post-glacial deposit; Land's End (Hockin). Of the variety Mr. Barlee dredged one specimen, and I another, in the Hebrides; it may be a distinct species. The typical form is fossil at Gravina in South Italy (Scacchi), and Palermo (Philippi). Taken on many parts of the Scandinavian coast from Finmark to Bohuslän, in 15–200 f. (Lovén and others), Croisic in Brittany (Cailliaud), Madeira, in 18–24 f., and the Canaries, in 20 f. (M'Andrew).

When crawling, the animal trails its long shell horizontally behind it. The upper portion of the spire is now and then twisted a little on one side, as in species of *Eulima*.

I named this well-marked shell *Eulima crassula*, and Forbes *E. MacAndrei*.

33. O. aci'cula*, Philippi.

Melania (afterwards *Eulima*) *acicula*, Phil. Moll. Sic. i. p. 158, t. ix. f. 6.
Eulimella acicula, F. & H. iii. p. 311, pl. xcviii. f. 9, 10.

Body nearly clear frosted-white, mixed with minute snowy flakes: *mantle* having the usual small fold at the upper corner: *snout* rather long, very broad, square in front, where it is deeply notched in the middle so as to divide that part into two minute roundish lobes; it is grooved the whole length, the groove being continued towards the neck, just separating the tentacles at their basal centre; at its upper surface, close to the base, is the orifice for the proboscis: *tentacles* diverging almost at a right angle, and resembling short, broad, minute leaves, each marked with an opaque-white stripe or vein through the middle; they bevel to a fine edge, and can, with their large flexible margins

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* A small pin for a head-dress, used by Italian women in ancient and modern times.

[like the tentacles of all other species of *Odostomia*], simulate ear-shaped folds; tips but slightly developed: *eyes* very black, not quite close to each other, and placed a little behind the inner bases of the tentacles: *foot* long (often extending on the march to the antepenultimate whorl) and very thin, square in front and expanding at the corners into rather sharp-pointed auricles, behind which it is gradually constricted towards the upper part of the body, and terminates in a narrow slender and acute point. (Clark.)

SHELL forming an attenuated and somewhat cylindrical cone, rather thin, semitransparent and of a polished lustre: *sculpture*, none to the naked eye or when examined with a hand lens, although, by applying the microscope with a high power, spiral striæ similar to those observable in *O. Scillæ* may be here also detected: *colour* clear white or glassy in live specimens, milk-white in dead ones: *spire* gradually tapering to a blunt point; nucleus like that of the last species: *whorls* 8–9 (besides the nucleus), regularly increasing in size; they are usually flattened, but never angulated; the last occupies from nearly half to a third of the shell: *suture* very narrow, slightly excavated, somewhat oblique, and margined in the manner described in my account of other species: *mouth* irregularly and obliquely rhomboidal, contracted or narrow above and expanded below: length about one-fourth of the spire: *outer lip* gently curved on the lower part, shelving or sloping downwards from a little below the periphery: *inner lip* imperceptible above the pillar, slightly reflected and straight (but now and then recurved or twisted) below: *umbilicus* none: *tooth* or fold rarely developed: *operculum* thin, and most delicately striated, with a very short spire. L. 0·175. B. 0·05.

Var. 1. *turris*. Shell of nearly equal breadth throughout, with rather convex whorls. *Parthenia turris*, Forbes, in Rep. Br. Assoc. 1843, p. 188.

Var. 2. *ventricosa*. Shell of a thinner or delicate texture, with tumid whorls and a deep suture. *Parthenia ventricosa*, Forb. *l. c.* *Eulimella affinis*, F. & H. iii. p. 313, pl. xcviii. f. 7.

Var. 3. *obeliscus*. Shell smaller and narrower, with more compact whorls. *O. obeliscus*, Jeffr. in Ann. & Mag. N. H. 3rd ser. i. p. 46, pl. ii. f. 5.

HABITAT: Sand, with an admixture of mud, in the coralline zone, on different parts of the British coasts;

local and by no means common. Peach has found it in the boulder-clay of Caithness, and Philippi in a post-tertiary bed at Palermo. It ranges north and south, from Upper Norway (M'Andrew and Barrett) and Bergen (Sars), through the Mediterranean and Adriatic, to the Ægean (Forbes), at depths of from 10 to 41 f. The 1st variety was procured by me in the Hebrides, and by Forbes in the Ægean; it resembles the *Chemnitzia nitidissima* of Searles Wood, a Crag fossil. The 2nd variety is rather widely distributed in our seas, from Guernsey to Shetland; and it has been recorded as Dalmatian by Brusina, Ægean by Forbes, and Algerian by Weinkauff under Dunker's name of *Eulima subcylindrica.* This variety has also been found by M'Andrew in Upper Norway, by Lovén in Bohuslän, by Martin in the Gulf of Lyons, by Macé at Antibes, and by Duminy at Ajaccio. Upwards of twenty years ago I referred the latter variety to the *Eulima affinis* of Philippi, but (as I am now convinced) erroneously. The size of that species is stated by him to be more than half as large again as *O. acicula*; and he compared it with *E. nitida.* I had previously described it under the name of *Eulimella gracilis,* and Requien as *Eulima turritellata.* My present and more matured opinion coincides with that of Clark and Malm in uniting it with *O. acicula,* because some specimens evidently form a passage from one to the other, and the distinction rests only on a single and variable character, viz. the comparative convexity of the whorls. The 3rd variety was dredged by Mr. Barlee in Skye and Shetland, and by Mr. Waller on the north-east coast of Ireland.

Specimens from Tarbert in Loch Fyne are more or less eroded, and sometimes truncated, owing probably to certain chemical properties or ingredients of the water in that inland gulf being unsuitable to the uniform composition of the shell. *O. Scillæ* is much larger and more conical than the present species, and has an angulated base.

The typical form is the *Turbonilla producta* of Lovén and, apparently, the *Pyramis lævis* of Brown.

34. O. NITIDIS'SIMA*, Montagu.

Turbo nitidissimus, Mont. Test. Br. (ii.) p. 299, t. 12. f. 1. *Aclis nitidissima*, F. & H. iii. p. 223, pl. xc. f. 6, 7.

SHELL needle-shaped, very thin, transparent and lustrous: *sculpture*, none in worn specimens such as are usually picked out of shell-sand from the beach, but in live or fresh specimens it consists of extremely fine and regular spiral striæ or impressed lines, which are slightly flexuous, rather widely and not close-set; they are easily discernible with a Coddington lens: *colour* clear white: *spire* gracefully tapering to a blunt point; nucleus entirely exposed and twisted obliquely upwards in various directions, resembling a miniature *Spirialis*: *whorls* 7 (besides the nucleus), very convex, and gradually enlarging; the last occupies rather more than one-third of the shell: *suture* wide and deep, decidedly oblique, and microscopically notched across: *mouth* regularly oval, not much expanded below; length about one-sixth of the spire: *outer lip* rounded, inflected just below the periphery: *inner lip* not so much curved, adhering to the upper slope of the base, where it is united with the outer lip, not reflected below: *umbilicus* and *tooth* none: *operculum* rather solid, delicately striated in the line of growth, and having a narrow flap. L. 0·1. B. 0·02.

HABITAT: Guernsey, Cornwall, Devon, Ireland (west, south, and east), Scarborough, Berwick, Moray Firth, Pentland Firth, West of Scotland, and Shetland, from 5 to 30 f. It has not occurred in any of our post-tertiary or quaternary deposits. I recognized in Professor Lilljeborg's collection at Upsala specimens which he had dredged at Mangerfiord in Finmark, in M. Cailliaud's collection at Nantes smaller specimens found by him at low water among *Gigartina mammillosa* and *Corallina officinalis* on the Plateau du Four in Lower Brittany, and in M. Martin's collection at Martigues other specimens similar to the last from Cape Couronne in the Gulf of Lyons; and I took this species myself at Spezzia.

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* Most glossy.

It is the most slender of all the *Odostomiæ*. My largest specimen (Zetlandic), which is a line and a quarter in length, has a diameter in the widest part equal to one-fifth only of that dimension.

Family XVII. IANTHI'NIDÆ, Deshayes.

Recluzia is the only genus besides *Ianthina* that has any good claim to be a member of this select and peculiar group; and as the systematic position of the former genus is somewhat doubtful, I will content myself with giving the characters of *Ianthina* only.

De Blainville called the family *Oxystoma,* Brown *Ianthinea,* and Agassiz *Ianthinoidæ.*

Genus IAN'THINA*, Bolten. Pl. III. f. 1.

Body globular, with a short posterior convolution: *mantle* folded at the base of the shell, and expanding into two irregular flaps or lobes, that probably serve as imperfect natatory organs ("epipodial fins," Mörch), and are fringed with fine cilia: *head* consisting of a thick, cylindrical, and occasionally swollen muzzle, terminating in a cloven mouth, which is encircled with minute and flexible cilia; and it is provided with a pair of cartilaginous jaws and a spinous tongue; this latter organ is armed with very long and awl-shaped uncini or lateral teeth, arranged in two rows, but it has no rhachis or central tooth: *tentacles* conical, each furnished at its base with a short finger-shaped offset or prong, so as to make the tentacles appear double or forked: *eyes* either wanting or said to be in certain species very small and indistinct and placed on the offsets of the tentacles: *foot* narrow, elongated, rounded in front and tapering behind; it secretes a large oblong foam-like apparatus, formed of air-cells and serving as a float to keep the animal always buoyant: *gills* 2, unequal in size.

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* From its violet colour.

Shell shaped like a *Helix*, with a broad and imperforate base, always of a purplish-blue or violet colour, but differently tinted according to the species: *epidermis* none: *spire* short, the last whorl being disproportionately large; apex styliform, and obliquely twisted on one side, but never heterostrophe: *mouth* somewhat triangular, and wide; lips disconnected: *pillar* more or less straight, ending in an angular point. No operculum.

Did Edmund Spenser ever see *Ianthinæ* in their native haunts? or were they visible to his inner eye only, when he wrote,

> "So likewise are all watr'y living wights,
> Still tost and turnéd with continuall change,
> Never abyding in their stedfast plights"?

Such is the wandering and restless course of the *Ianthina*, floating passively on the surface of the ocean, with its shell downwards and its foot to the skies, the continual sport of winds and waves, and driven hither and thither without choice, without hope of reaching any goal. But woe to them if they approach the shore! That is not the haven where those sailors would be; for here they are inevitably wrecked and stranded: it is thus that we claim one kind of *Ianthina* as a product of the British seas.

The earliest notice which we find of this remarkable mollusk, or "blue snail," is in the 'Opusculum de Purpura' of Fabio Colonna (one of the many noble authors whose writings are not less illustrious than their names), published at Rome in 1616. It contains a fair representation of the naked animal, with its forked tentacles, and the cellular apparatus or float by which it is suspended in the water. This apparatus he compares to a mass of cartilaginous and glassy foam, or to a cluster of small soap-bubbles, such as the Neapolitan boys were in the habit of making for their amusement and launching out of a window, balloon fashion, which he, perhaps feelingly, called "jocum non jucundum!" The beautiful purplish-blue dye which is copiously emitted by the *Ianthina*, staining not only the hands of those who collect it but also white paper and linen, and which gives the shell its permanent colour, was likewise the theme of his learned and accurate observation. But either the simplicity or the prurience of the scientific language used in his time unfortunately prohibits the above excellent treatise being now reproduced at greater length. Even some of the works of Linné, whose style was more severe than loose, are not free from what in the present day would be reckoned faults of indecency. Nearly a century after the date of Colonna's work Breyn again figured the animal of *Ianthina*, although badly. Further information seems to have been wanting until 1757, when Carburi, a noted Greek mechanician, briefly redescribed it in a letter to Marco Foscarini. He mentions a strange notion entertained by his countrymen, viz. that the *Ianthina* produces the *Velella*, a well known kind of oceanic Hydrozoa, which usually accompanies the *Ianthina* and is wafted along by means of its erect gnomon-like crest. They consequently gave it the name of "Armenistarimane," compounded of two Hellenic words signifying mother of the sail-berry. That idea must have originated in the mollusk being sometimes found attached to the hydrozoon, as if the latter issued from it. Carburi had often seen this, and he observed that the *Ianthina* held the *Velella* by its mouth, not unfrequently swallowing half of it; he also on several occasions discovered young *Velellæ* in the stomach of an *Ianthina*. In 1776 the celebrated Eastern traveller Forskål gave, among other interesting particulars of the *Ianthina*, an account of its fry. The species which he examined was evidently a viviparous one, *I. communis*. He says that each of the fry has in front of its shell two transverse roundish lobes (vela), covered with vibratory cilia, with which it rowed itself through the water. His further statement that the float adheres to the mantle of the animal, and his supposition that the ovary or matrix is placed in the proboscis, are incorrect. The figure given by Bosc is merely a copy of Colonna's; he hazarded the unwarrantable assertion that the *Ianthina* absorbs the air contained in its float-cells and refills them at pleasure. Admirable details of the anatomy were published in the 'Mémoires' of Cuvier, who acknowledged the aid he received in these investigations from three zealous naturalists, MM. Homberg, Savigny, and Péron. He regarded the float as the rudiment of an operculum, transmuted by organic action; and he believed that the animal could withdraw it into its shell, as well as that some individuals have naturally no float, or that it is only developed at a certain age or at a particular season of the year. All these opinions would unquestionably have been modified, if not renounced, by the illustrious zoologist, had better opportunities occurred to him of examining the organization of this mollusk. Mr. Bennett tells us (Med. Gaz. 1834, p. 233) that when the *Ianthina* was purposely irritated, it had no power of withdrawing the float, which always remained stationary, even when the animal retired into its shell. Subsequent experiments have shown that this apparatus is necessary to the existence of the animal. While on this part of the subject I would call especial attention to a paper by Dr. Reynell Coates, which appeared in the 'Journal of the Academy of Natural Sciences of Philadelphia' for 1826, entitled "Remarks on the floating apparatus, and other peculiarities of the genus *Ianthina*." The author's observations were made during a voyage to the East Indies. As to the mode in which the float is constructed, or rather repaired, he says that on a living specimen being placed in a tumbler of sea-water, and a portion of the appendage being removed by scissors, the animal very soon commenced supplying the deficiency in the following manner:—the foot was advanced upon the remaining vesicles until about two-thirds of it rose above the surface of the water; it was then expanded to the uttermost, and thrown back upon the water, like the foot of a *Limnæa* when about to swim; in the next place it was contracted at the edges, and formed into the shape of a hood, enclosing a globule of air, which was slowly applied to the extremity of the foot. A vibratory movement could now be perceived throughout the foot, and when it was again thrown back to renew the process, the globule was found enclosed in its newly constructed envelope. The vesicular membrane is evidently secreted by the foot, and is probably of the same nature as the byssus and glutinous filaments of other mollusca. The shape of the float varies according to the species. He adds, "It does not appear that the janthinæ ever sink below the surface, when they remain attached to the vesicle; but when they are entirely separated, they immediately fall to the bottom of the tumbler, and are unable afterwards to rise from their position, and though they continue to be vigorous for some time, they generally die in a few days." Mr. Arthur Adams has also furnished some important information* with respect to the habits of the *Ianthina* and the structure of its float. He says, "The animal floats shell downwards, with the vesicular buoy above it directed backwards. The anterior part of the foot is mobile, free, rounded and dilated, and the sides are usually folded inwards, forming a shallow cup, which embraces the smooth anterior rounded end of the float. When the animal wishes to bring its head to the surface of the water, this part of the foot is made to glide over the back of the float. Thus the animal can raise and lower itself at pleasure by means of its own float." . . . . "When the animal is weakly or dead, the float readily becomes detached, for there is no organic connexion between it and the foot." [I may suggest, by way of parenthesis, that when an *Ianthina* is snapt up by a fish, its float would be detached and remain on the surface of the water. This may account for the number of loose floats observed by Mr. Adams, Dr. Wallich, and others.] "When a portion is cut off, the float is enlarged at the end next the foot of the animal, and is not regenerated at the excised part." . . . . "With a pair of sharp-pointed scissors I made incisions into the floats, and allowed the air to escape, when the animals gradually descended, and remained helpless at the bottom of the vessel: the floats were not regenerated or renewed during the period the animals remained alive. Crepitating portions, when separated, continue buoyant until the vesicles of which they are composed gradually collapse from the escape of the air with which they are distended; and the floats, when pounded in a mortar, are readily reduced to a mucus." Professor Lacaze-Duthiers has very lately (Ann. Sc. Nat. Dec. 1865) confirmed the observations of Dr. Coates and Mr. Adams. He had an opportunity in 1862 of examining several living specimens which were blown ashore in the Bay of Bouliff near Calles in Algeria. They were placed in an aquarium, where they commenced to put their damaged floats in repair. The float is formed with tolerable regularity, the cells of which it is composed being polygonal, owing to their mutual pressure. The original form of the cells, however, is circular, as may be seen in those on the extremities of the float. The foot of the animal is divided into two distinct parts. The hinder and larger part is flat, and to this the float adheres; the anterior part is rounded in front, and it is this part which constructs the float. Without the beautiful drawings which accompany the paper it will be difficult to give a clear idea of the *modus operandi.* The anterior part of the foot is extremely flexible, and the animal has the power of causing its extremity to assume a cup-shape; when in this position the foot is laid on the float at the spot where a new cell is to be added, the edges of the foot embrace the float, and the extremity or point is raised up, out of the water, in the cup-shape already mentioned, so as to collect a small portion of air. The animal is now seen to move the foot backwards and forwards, as if to secure the firm attachment to the float of a glutinous film or layer which at the same time exudes from the foot. When the animal removes its foot, this glutinous film has become a cell and remains attached, with its imprisoned air-bubble. M. Lacaze-Duthiers noticed that all the specimens which had lost their floats, although perfectly alive, remained at the bottom of the water, and that some of the more lively crept with the foot, slowly and painfully, up the sides of the vessel, and on reaching the top they turned on their backs, but usually without being able to make a new float; these fell again heavily to the bottom and soon died. He never saw any swim, like other Gastropods. Clark combated the idea that the float or vesicular mass attached to the foot is a hydrostatic apparatus; and he asserted that this organ is "the membranous vehicle of the contents of the ovarium and matrix, that has descended from under the mantle, and fixed itself to the foot, for a very obvious purpose of the animal economy in reference to the pulli in the genial season." I will not comment on this curious assertion further than by observing that every *Ianthina* of both sexes, viviparous as well as oviparous, has a float, and that the mode of its construction was fully explained more than a quarter of a century before Mr. Clark wrote. *Ianthinæ* can scarcely be considered gregarious, their locomotion being almost involuntary. It is only when driven together by winds or currents that they appear to congregrate in shoals near coast lines. Some of the old naturalists must have drawn largely on their bank of imagination in making up their accounts of the *Ianthina.* Born gravely assures us that it lives in the depths of the sea, and in stormy weather rises to the surface, shining with a phosphoric light. I do not know where he got this idle tale. All modern naturalists, who have observed the *Ianthina* during long voyages, speak of its appearance in fine weather, dotted here and there over the ocean. Dr. Wallich says that in actual calms it was easy enough to see its floating standard, partly raised above the surface, but at other times it was only by dint of the keenest watching and getting gradually accustomed to detect the outline of the float, that he could distinguish it from the surrounding foam; and he further remarks that the colour of the shell so nearly approaches that of the waters of the open sea as to render it almost invisible, except at close quarters—as, for instance, from the gunwale of a boat. Mr. Benson (Ann. & Mag. N. H. 3rd ser. vi. p. 405) compares the float, seen under these circumstances, to a minute flock of cotton, broad at one end and pointed at the other. It is still a question whether any species of *Ianthina* is furnished with eyes. Risso describes the animal as having "les yeux pédonculés;" but his authority is not infallible. Lesson and Rang also placed the eyes at the points of the tentacular prongs; D'Orbigny at the outer base of the tentacles. According to Arthur Adams, the "eyes are very small and indistinct, and are placed on a short peduncle on the outside of the conical tentacles." He, however, has since given a different account, as follows:—"The animal is entirely blind. I sought in vain for eyes, both at the base and apex of the longer, external, pointed tentacle, and likewise at the truncated apex of the inner and shorter tentacular process. No trace of eyes was visible, although an accidental dark round spot of pigment may have been mistaken for these organs." My own examination of specimens, preserved in spirits, of *I. communis* and *I. globosa* induces me to agree with the last observation: I could not detect any vestige of eyes. The habitat of the *Ianthina* is determined by the nature of its food, which principally consists of *Velellæ* and similar animals. Coates indeed found that some were cannibals, having in their digestive tube shells of other *Ianthinæ*, whose diameter was three times that of the œsophagus in its usual state. Its zoophagous tastes appear to be even more varied. "Although doubtless the chief food of *Ianthina* consists of *Physaliæ*, *Porpitæ*, and *Velellæ*, which are usually seen floating in its society, on the surface, in calm weather, yet an occasional Barnacle does not seem to come amiss to the blind Snail of the Ocean. From the stomachs of several I extracted fragments of the tufted feet of *Lepas*; and in one which I examined the *Lepas*-remains occupied the entire length of the œsophagus." (A. Adams.) Mr. Benson says that when the snout is protruded, the flexible cilia round the mouth are extended and agitated with great rapidity, apparently in search of food. The top of the living shell is now and then crowned with a cluster of *Lepas pectinata* or of *L. fascicularis*. I may also mention, on the authority of Mr. Benson and Dr. Wallich, that the float is often infested with a small swimming crab of a brilliant blue colour like that of the shell; this uses the float as a raft.

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* Ann. & Mag. N. H. Dec. 1862.

The sexes of *Ianthina* are separate. Fritz Müller has minutely described the spermatozoa of the male, which are clothed with long delicate microscopical hairs or filaments, forming a swimming-apparatus. As in *Littorina*, so in the present genus, some species are oviparous, and others viviparous. In the former case the eggs, when excluded from the ovary, are enclosed in cells, and attached (probably by the foot of the parent) to the under side of the float, from which they hang thickly but separately. Achille Costa computed the number produced in the breeding-season by each individual at no less than a million. Owing to the pelagic and wandering habits of the animal, its own float would certainly be the best nidus it could have, if indeed any other were at hand at the time of parturition. Professor Costa (not Achille) erroneously stated that the egg-cases attached to the float belong to another mollusk. It reminds one of the famous controversy, which so long disturbed the peace of conchologists, about the supposed parasite that inhabited the shell of *Argonauta*, and (cuckoo-like) laid its eggs there. According to Philippi (Handbuch, p. 179) the fry of *I. communis*, before it is excluded from the matrix, has an operculum, and its *velum* or hood is furnished with vibratile cilia and two large black eyes. Embryonic shells of this species and of *I. rotundata* which I have examined under a microscope are nautiliform, of a yellowish-brown colour, and resemble in shape those of *Stilifer*. I could not discover an operculum in any of the specimens, although the mouth was closed by a film of dried animal matter. The *Ianthina*, when irritated, discharges a beautiful purple or violet-coloured liquid in considerable quantities. Captain Cook observed that each individual yields about a tea-spoonful. This liquid, says Mr. Adams, "is at first equally diffused, but shortly sinks to the bottom in the form of a deposit, leaving the water pellucid. The bag or reservoir containing the colouring-fluid is visible through the skin on the back of the neck; and the fluid is poured direct into the branchial cavity, and makes its escape from under the free edge of the mantle. My dyeing operations with this purple fluid were not crowned with success, the beautiful colour fading gradually away, leaving magenta and mauve yet possessors of the field." It was suggested, in a review of the first volume of the present work, which appeared in the 'Parthenon' of 21 June 1862, that the colour of this fluid is due to chloride of gold, and that the secretion is of a poisonous nature. I am no chemist; and I regret that my literary gleanings have not enabled me to solve the former problem. The origin of the colouring-matter of shells and other animal productions, as well as of that of vegetables, seems to be involved in nearly equal obscurity. Liebig attributed the red and blue colours of flowers to ammonia; but whence is the ammonia derived? We know that gardeners can produce differently tinted flowers in an *Hydrangea* or a *Dahlia* by the empirical application to the soil of certain mineral admixtures. Cannot Nature do as much for marine animals by a prescient combination of similar ingredients in the sea-water? With respect to shells Mr. C. Stewart has satisfied me that *Littorina obtusata,* when calcined or even subjected to the heat of a lamp-flame, quite loses its colour, which, he remarks, would not be the case if that colour had a mineral for its base. But many minerals possess an intense colour which they lose entirely when heated to a certain temperature. This phenomenon has been lately explained by M. Wyrouroff of Moscow in the Bulletin of the Chemical Society of Paris. The late Professor Forchhammer, in a lecture on the metals in ashes of plants (Report of the Danish Association of Agriculturists, 1855) stated that manganese constitutes the colouring-matter of the brown rings or bands and lip of certain snails (e. g. *Helix nemoralis*),—the snail getting the manganese from the plants on which it feeds, and these again from the soil. He also confirmed a discovery previously made by chemists, that the field and garden slugs contain copper, which occurs in wheat and other cultivated plants. Here I must for the present leave the question. The oceanic distribution of *Ianthina* is coextensive with that of the temperate and torrid zones, although it especially frequents the latter. None have been found in the arctic or antarctic seas, or in a fossil state. Five species occasionally visit our shores, being brought hither by the Gulf-stream and a continuance of westerly gales. One only I regard as British, and that not without considerable doubt.

The systematic position of the genus is scarcely settled. Its founder, Bolten, associated with it several widely dissimilar shells. Lamarck defined the genus and made it recognizable. It was at one time placed by the last-named author in his class Heteropoda, a division based on the anomalous character of the foot and pelagic nature of the animal; but this class was repudiated by Cuvier, and is not maintainable in a scientific point of view. The organization of *Ianthina* does not differ in any essential respect from that of other Gastropods. Its synonyms are not numerous; they are chiefly mere MS. names, viz. *Neritoidea,* Humphreys, *Ianthinus,* De Montfort, *Amethistina,* Schintz, *Iodes,* Leach, and *Achates,* Gistel. The old Dutch naturalist Rumph called it "Quallebootje," translateable as the boat of a *Holothuria*; and De Montfort agreed with him in the propriety of the name, believing that *Ianthina* had a greater affinity to that animal than to the Mollusca!

IANTHINA ROTUNDA'TA*, Leach.

I. rotundata (Leach, MS.), Dillwyn, Contributions towards a History of Swansea (1840), p. 59. *I. communis*, F. & H. ii. p. 549, pl. lxix. f. 6, 7, & cxxxiii. f. 1.

SHELL forming a depressed cone above and a shorter one below, somewhat globular, with a bluntly angulated periphery, thin, semitransparent, and glossy: *sculpture*, minute and close-set spiral striæ, which are often wavy and interrupted by the flexuous lines of growth; the base exhibits stronger intermediate spiral striæ: *colour* white, tinged with purple or mauve on the upper side, deepening into violet beneath; a broad and deeper-hued band sometimes encircles the base, which is then whitish, like the upper side; the apex or nucleus is pale amber-colour: *spire* abrupt: *whorls* 4 (besides 3 which constitute the stiliform apex), swollen and bulging outwards, compressed and sloping towards the suture; the last is three or four times the size of all the rest put together; the apex or nucleus (which resembles in shape the shell of *Stilifer Turtoni*) is partly sunk within the spire, and obliquely turned in various directions: *suture* rather slight but distinct: *mouth* irregularly triangular; the base of the triangle is the pillar, the lower part of which is reflected outwards, and forms a more or less sharp angle: *outer lip* gently incurved below the periphery, widely and deeply sinuated in the middle: *inner lip* consisting of a white film, which lines the upper side of the base within the mouth and is folded back on the under side over the pillar; this is twisted and nearly perpendicular. L. 1·2. B. 1·35.

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* Rounded.

Habitat: Occasionally cast on shore, from July to November, in the south and west of England and Ireland, and the Bristol Channel. To these localities may be added the north of Ireland (Turton and Thompson), Portrush, co. Antrim (Turton and Brown), Loch Ryan (James Smith), and Skye (Forbes, MS.). The foreign distribution of this species is doubtful; I can only venture to give Brittany (Cailliaud and Taslé), Madeira and the Canary Islands (M'Andrew), and probably the Azores (Drouet). Dr. Mörch informs me that no *Ianthina* or other oceanic animal has been observed on the shores of Denmark.

When I found living specimens on the Welsh coast (nearly forty years ago) I was a boy, and cared for the shells only; the animal did not then interest me. Clark's description of the latter is generic; and that given by Forbes and Hanley seems to represent some species of the oviparous section, because it mentions the egg-vesicles. The present species is certainly viviparous. Young as well as adult specimens contain perfectly formed fry of a whorl and a half. The shell is sometimes distorted, owing to an imperfectly repaired fracture, or to the mantle having been injured. In 'Loudon's Magazine of Natural History' for July 1834 will be found an interesting notice by Dr. Turton of the appearance of this *Ianthina* in the small coves about the

Land's End. He says it is there "occasionally wafted, by a gentle south-west wind, in prodigious fleets, all alive, and borne upon the water by their clusters of tough bubble-like vesicles. By the retreating waves most of them are carried back into the ocean; so that it requires a fortunate combination of tide, wind, and wave to see them in all their splendour. This mostly happens about the months of July and August. The fishermen's wives call them bullhorns." According to M. Drouet the inhabitants of Pico in the Western Isles give these shellfish the name of "agoa viva," and pretend that they fasten themselves on the limbs of persons bathing. Did they not mean the *Physalia,* or some animal of the *Medusa* kind?

I do not consider the present species the *Helix janthina* of Linné or *I. fragilis* (afterwards *communis*) of Lamarck. That has a smaller and lilac-coloured shell, with a sharp peripheral keel; and it is exotic. Our shell is the *I. Brittanica* of Leach's later MS., and *I. communis* of the Index to Wood's Supplement and of Brown's Illustrations; the young has been figured and described by Reeve as *I. Smithiæ.* One manuscript name is as good as another; in adopting *rotundata* I select the oldest.

Other species which have been carried northwards by the Gulf-stream, and driven ashore on our southern and western coasts, are *I. communis, I. globosa* of Swainson (a tropical species), *I. pallida* of Harvey (Straits of Magellan), and *I. exigua* of Bruguière, from Chili and the South Atlantic. With respect to the last species, the late Professor Harvey told me that he once received a box of specimens, at least 500 in number, which a relation of his had picked up in a single day on the beach at Kilkee in county Clare, not one of them containing the animal. Several *Spirulæ* were found at the same time. It shows the capability of certain shells keeping afloat during so extensive a voyage and for such a long time as must here have been the case. No species of *Ianthina,* except *rotundata,* has been noticed on our shores with the animal, alive or dead, in its shell.

Family XVIII. STILIFE'RIDÆ, (*Styliferidæ*)
H. & A. Adams.

None but the typical genus *Stilifer* being known, it is superfluous to repeat the characters, which will be presently given in the generic description. This family is evidently distinct from any other, in respect of the quasi-parasitic habits of the animal, its tongueless and suctorial mouth, and the absence of an operculum.

Genus STI'LIFER*, Broderip. Pl. III. f. 2.

BODY spiral, covered with cilia: *mantle* folded on the right-hand side, so as to form a slight branchial canal, and spread over the base of the shell: *head* snout-like, furnished with side-lobes, and terminating in an unarmed and suctorial mouth: *tentacles* cylindrical: *eyes* sessile, placed on the neck behind the tentacles: *foot* tongue-shaped, and partly tubular, with a slit in the sole: *gill* one only? *Sexes* separate.

SHELL oval or elongated, not umbilicate: *spire* compact, with a stiliform and excentric apex: *mouth* roundish or oval; lips disconnected: *operculum* none.

The shell resembles the nucleus of that of *Ianthina*; and the animal is also destitute of an operculum; but that mollusk has a denticulated or spinous tongue, and the body is not ciliated. Their habits also are very different. *Eulima,* although allied to the present genus, has a smooth body and an operculum, and it is not parasitic; nor is the apex of its shell style-like or irregular.

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* Stake-bearing; or from its style-like apex.

For the discovery of this curious mollusk science is indebted to the indefatigable labours of Dr. Turton. In the 'Zoological Journal' for October 1825 an article by him, entitled "Description of some new British Shells," comprised one which he named *Phasianella stylifera,* and of which he says, "we found a dozen of these beautiful little shells alive, and attached to the spines of the *Echinus esculentus,* dredged up in Torbay." Not many years afterwards Mr. Broderip made known the peculiar nature of the animal, in consequence of Mr. Cuming having brought home, amongst other conchological rarities, specimens of another species (*S. astericola*) burrowing or imbedded in a tropical kind of starfish. Mr. Arthur Adams subsequently published an account of another species (*S. ovoideus*) having the same apparently parasitic habits; and our British species (*S. Turtoni*) has been repeatedly observed attached to several kinds of *Echinus.* Another species (*S. Orbignyanus*) having been detected by M. Hupé enclosed in the basal portion of the spines of a *Cidaris,* which had been enlarged for its accommodation, Dr. Fischer suspected that *Stilifer* is not a true parasite, and does not feed on the Echinoderms infested by it. I have come to a similar conclusion, from a careful and long-continued observation of living individuals of *S. Turtoni*; and I believe that *Stilifer* subsists on the excretions of Echinoderms. This opinion is founded on the facts that all the *Stilifers,* British and foreign, which I have seen (and they were numerous) invariably occupied only the area of the vent or anal orifice of Echinoderms, and that some which I watched with close and almost unremitting attention for many hours, although they were most lively, nestling or slowly crawling about among the spines of an *Echinus*, never attempted to touch with the proboscis or mouth either the protruded suckers or the *pedicellariæ* of the *Echinus*, or any part of its investing membrane. As far as I have been able to observe, the *Stilifer* does not put its host to the slightest inconvenience. No *Stilifer* has been noticed in any other habitat; and its connexion with seaeggs and starfishes is evidently neither accidental nor merely for the purpose of shelter. The suctorial proboscis, as well as the want of a denticulated tongue in *S. Turtoni*, strengthens the supposition that its food consists of extremely soft or semifluid matter, and not of organisms which have any degree of solidity. *Dentalium*, which preys on hard-shelled Foraminifera, has a complicated lingual apparatus; and even the little *Rissoa*, that feeds on seaweeds, often of the most delicate and filmy texture, possesses a pair of horny jaws, besides a tongue armed with a strong central tooth, flanked on each side by a formidable row of serrated lateral teeth. *Stilifer* has nothing like a jaw or tooth. For these reasons I do not consider *Stilifer* a true parasite, nor yet an epizoic organism, like *Montacuta substriata*, deriving its nutriment from the vicinity of the animal to which it attaches itself—but as holding an intermediate relation. Its scavenger-habits are not unlike those of the dung-beetle. I would recommend those who care to pursue this inquiry to consult Hupé's paper in the 'Revue et Magasin de Zoologie' for March 1860, and Fischer's monograph on the genera *Stilifer* and *Entoconcha* in the 'Journal de Conchyliologie' for April 1864. They may also see in the 'Report of the British Association,' published in 1865, some further remarks of mine on the subject. In the 'Record of Zoological Literature' for 1864 Mr. Greene says that the "opinion" which I have above expressed is "by no means proven." It is impossible to prove an opinion; but the facts on which mine was based remain undisputed. The spawn of *S. Turtoni* is deposited on the upper surface of the *Echinus* on which it settles. Although the present distribution of *Stilifer* is very extensive, no species appears to have been discovered in a fossil state.

Various have been the positions which conchologists have from time to time assigned to this remarkable mollusk in their systems of classification. Turton, as we have seen, placed it in *Phasianella*; Fleming in *Velutina*, although he pointed out the incongruity of the allocation; Reeve at first between *Turritella* and *Cerithium*, but recently between his *Canalifera* and *Turbinacea*; Macgillivray among his *Turbinina*, next to *Lacuna*; Forbes and Hanley, as well as Woodward, in *Pyramidellidæ*; H. & A. Adams as a distinct family between *Eulimidæ* and *Cerithiopsidæ*; Clark in *Pyramidellidæ*, between *Aclis* and *Scalaria*; and Gray also in the same family between his genus *Hyala* (*Rissoa vitrea*) and *Entoconcha*. I am inclined to agree with Messrs. Adams in making *Stilifer* the type of a separate family; but it is much more difficult to say to what other families it has the nearest affinity. *Pyramidellidæ*, as represented in our seas by *Odostomia*, ought not to be far off; and *Ianthinidæ* have similar relations to it, in respect of the nucleus or apex of the shell. *Homalogyra* has sessile eyes, placed on the neck, as in *Stilifer*, and it is also finely ciliated all over; but in that genus the animal has no tentacles, and the shell is discoid and operculate. The presence or absence of an operculum is, to a limited extent, a good generic character, although certain allied genera (e. g. *Mangilia* and *Conus*) comprise species some of which have an operculum and others not. The stiliform spire in the present genus, although remarkable, is not peculiar to it, nor to *Odostomia* or *Ianthina*. *Melampus bullæoïdes* has the apical whorls formed in the same mammillated fashion; and in several genera of the *Bullidæ* the shell exhibits the same feature. These, however, may be regarded as cases of analogy rather than of affinity. The first formed whorls or nucleus of the spire, in many univalves, cease to be occupied by the animal after it has attained a certain growth, being too small for its requirements,—like a householder, who usually moves, once at least during his life, into a tenement larger than the one he at first inhabited. In the case of the Mollusca above referred to, the original and now useless tenement remains affixed to the new one; but in *Bulimus decollatus*, some species of *Clausilia*, and in *Truncatella truncatula* the topmost story is knocked off and replaced by another roof. *Cæcum glabrum* and *C. trachea* even undergo a partial metamorphosis, the shell of each having at first a regular spire, and when this is lost becoming a slightly curved cylinder. The genera *Leptoconchus* of Rüppell and *Campulotus* of Guettard (*Magilus* of De Montfort) also appear to be related to *Stilifer* in their quasi-parasitic habits. The first-named genus is destitute of an operculum, except in its younger state; the second has an operculum at all ages. The conjecture of the late Professor D'Orbigny that *Stilifer* ought to merge in *Eulima*, because the latter may likewise be parasitic, has no foundation. It is true that species of *Eulima* have been found in the stomachs of *Holothuriæ*; and the "trepang," or dried "bêche de mer," of which the Japanese are so fond, frequently contains these shells. But this is not a case of parasitism: the *Eulima* feeds the *Holothuria*, instead of feeding upon it.

The name of this genus has been of late years, probably from carelessness, incorrectly spelt with a *y*, viz. *Stylifer*. Although the Greek orthography is followed in our word style, the Latin word is *stilus*, and not *stylus*; it is, of course, from the Latin that *Stilifer* is derived. Broderip was too good a scholar to have made such a mistake. It has been lately suggested that the name is compounded of the Greek words στῦλος and φέρω; but if that were so the name would be Stylipher, as in *œnophorum*. Whether it is correct to form a generic name with an adjective, may be open to doubt; but use has sanctioned it in the present instance, as well as in *Spirifer*, *Stiliger*, *Lobiger*, *Ianthina*, *Vitrina*, and many other names of general acceptation. Fleming suggested that the *Phasianella stilifera* of Turton "should probably constitute a new genus—*Stylina*." This was prior to Broderip's publication. However, Fleming's suggestion was not accompanied by any diagnosis; and the name *Stilina* had been twelve years previously engaged by Lamarck for a tropical genus of stony Polypes. Its adoption for the mollusk also would, moreover, be contrary to the law of usage, *Stilifer* having now been recognized for between thirty and forty years. I am aware that this is one of the questions of scientific nomenclature upon which naturalists are by no means agreed. I do not pretend to set myself up as a judge, and my opinion may be taken for what it is worth.

STILIFER TURTO'NI*, Broderip.

Phasianella stylifera, Turton in Zool. Journ. ii. p. 367, t. xiii. f. 11. *Stilifer Turtoni*, Brod. in Proc. Zool. Soc. 1832, p. 61. *Stylifer Turtoni*, F. & H. iii. p. 226, pl. xc. f. 8, 9, and (animal) pl. OO. f. 5.

BODY white and delicately stippled; cilia innumerable, arranged in scale-like bundles, and in constant action: *mantle* thickened at its edges; canal terminating in an oval or roundish hole: *head-lobes* (which perhaps may be expansions of the foot, as in *Natica*) rounded and flattened, nearly transparent, one on each side, and placed a little below the mouth: *snout* rather long when extended, but usually folded or curling inwards, like an elephant's trunk, slightly bilobed at the extremity; it lies between the tentacles and the foot: *tentacles* club-shaped, somewhat compressed, thick, and rather long, sometimes enlarged towards the tips (which are blunt), widely diverging, but united at their bases; they are more or less strangulated or constricted, usually at about one-fourth of the distance from their bases; the cilia with which they are covered seem to produce a circulating current: *eyes* exceedingly small, placed at some distance behind the tentacles: *foot* elongated, in front bulbous and forming a creeping disk, behind somewhat tubular and tapering to a fine point; the sole is slit backwards down the middle for more than three-fourths of its length, the opening or commencement of the slit being of an oval shape: *male organ* spiked and resembling an auxiliary tentacle.

SHELL globosely conical or oval, with an obliquely rounded base, thin, semitransparent, and lustrous: *sculpture*, microscopical and flexuous lines of growth, and a few extremely slight and indistinct spiral striæ: *colour* light reddish-brown or amber, which appears to be superficial, as it soon fades and becomes whitish: *spire* divided into two parts, the first-formed part or nucleus consisting of a minute and very short cylinder, which is erect, although twisted slantingly in different directions; the other part or main body of the spire is short and abruptly separated from the nucleus: *whorls* 3–4 (besides 2–3 which compose the stiliform apex), very tumid, and rapidly enlarging; the last is enormous in proportion to the others: *suture* rather slight, but distinct: *mouth* more round than oval, not much expanded at the base: *outer lip* thin, inflected just below the periphery, whence it slopes obliquely downwards: *inner lip* consisting of an almost invisible film on the upper part, thicker below and folded back over the pillar, which is deeply curved and flexuous. L. 0·15. B. 0·1.

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* Named after Dr. Turton.

Habitat: On *Echini* in several parts of the British seas, from 20 to 80 f.: viz. on *E. esculentus,* Linn., or *E. sphæra,* Müll., Torbay (Turton); on *E. saxatilis,* Linn., or *E. miliaris,* Lam., Plymouth (Stewart and others); on trawl-refuse containing *E. esculentus* from Plymouth (J. G. J.); Falmouth (Miss Vigurs, *fide* Cocks); Filey (Miss Backhouse, *fide* Leckenby); on *E. saxatilis,* Scarborough (Bean); on *E. esculentus,* Cullercoats (Alder); on *E. saxatilis,* or an allied species for which Mr. Norman has proposed the name of *pictus,* Sunderland (Howse); on *E. esculentus,* Berwick (Johnston); on *E. Dröbachiensis,* Müll., or *E. neglectus,* Lam. (if the former is not *E. Flemingii* of Ball), Shetland, 40 miles N.E. of the Whalsey Skerries, in 78 f. (J. G. J.); Dublin, mixed with *Lacuna divaricata* (Humphreys). The shell described by Professor Macgillivray, in his 'Molluscous Animals of Aberdeen, Kincardine, and Banff,' as *Stylina stylifera,* and stated to have been found by one of his pupils "adhering to an *Actinia* brought up by the lines," was the young of a common West-Indian land shell, belonging to the *Cyclophoridæ.* The habitat alone might have induced a suspicion that this shell was not our *Stilifer*; and I had an opportunity of ascertaining what it really was. The foreign distribution of *S. Turtoni* is little known. According to Lovén it inhabits *E. neglectus* on the Swedish and Norwegian coasts; Asbjörnsen found it on *E. esculentus* at Dröbak and from fishing-grounds at two other places in Christianiafiord; Sars in Finmark; Malm on *E. neglectus* at Löken in the Götha estuary; and M'Andrew in the Canary Isles. Fischer has recorded it as not uncommon on *E. lividus* near the mouth-opening; but he cites no authority for such a strange habitat. *E. lividus* excavates holes in slate and gneissic rocks, within tide-marks, its mouth and the whole of the lower surface being pressed closely to the stone. A parallel instance of the same species of mollusk infesting different Echinoids is that of *Montacuta substriata,* which has been observed not only on *Spatangus purpureus,* but also on *S. meridionalis, Amphidetus ovatus, Brissus lyrifer, Echinus esculentus,* and *Cidaris hystrix.*

The Shetland specimens (a pair) were attached by the foot to an *Echinus,* on its upper surface at the base of the spines. They did not adhere firmly to the *Echinus,* like the *Caligus* to a codfish, but frequently shifted their places by creeping between the spines. I gently moved one of the specimens with a stiff camel's-hair brush, and placed it in a glass tube with sea-water. It was at first very sluggish or timid, and evidently unaccustomed to its new quarters, and lay at the bottom of the tube; it afterwards recovered itself, and crept up the side by means of the anterior portion of its foot, very slowly and by an imperceptible movement; the other part of the foot was not applied to the glass, but rested on the mantle. The foot was occasionally twisted about and contracted, as if through uneasiness. The animal was never wholly withdrawn into the shell, although I irritated for that purpose. The slit in the foot probably serves for the admission of water into some tubular cavity or vessels which permeate this organ; it would have the effect of enlarging and swelling the foot, so as to protect the *Stilifer* from being crushed by the spines of the *Echinus.* The force exerted by the *Echinus* in moving its spines may be insufficient to counteract even the slight pressure of the *Stilifer* against them at their base. The upper part of the sea-egg was covered with about 40 clusters of spawn, in various stages of development, evidently belonging to the pair of *Stilifers* above mentioned. The fecundity of this species must be very great; and the shell therefore ought not to be rare. I counted at least 100 fry in one of the clusters of spawn; so that one sea-egg would yield in a single year a prospective harvest of 4000 specimens—enough to supply almost all the conchologists in the world, unless some of them were more greedy than usual. Moreover one of the adult *Stilifers* appeared to be full of spawn, which was perceptible through the transparent shell. Since an *Echinus* could barely accommodate half a dozen individuals when they arrived at maturity, what would have become of the rest, supposing they escaped being the prey of other animals? Would they have migrated, and formed colonies on other sea-eggs? The *Stilifer* possesses both a foot and eyes; and appropriate quarters are by no means wanting in the same part of the sea-bed whence I procured the specimens which have given rise to the above remarks. The spawn-masses are oval, each enveloped in a gelatinous case. When detached, and examined under a microscope, the fry was seen to have three lobes, the larger two of which were in front; the lobes were finely ciliated, the cilia being rather long, and their points sometimes touching the surface of a small glass tube which contained the detached fry. These rapidly whirled about by the aid of their cilia, on which they now and then rested. They occupied nautiloid shells of a single whorl, into which (unlike the adult) they were capable of entirely withdrawing. The embryogeny of *Stilifer* has also been noticed by Dr. Otto Semper in Siebold and Kölliker's 'Zeitschrift für wissenschaftliche Zoologie' for 1864, and placed by him in the same category with that of *Eulima* and *So-*

larium; but he scarcely gave any other result of his observations. The late Mr. Stewart of the College of Surgeons (whose untimely death is still deplored by all who study the British Echinodermata) was of opinion that *S. Turtoni* infests *Echini* for the sole purpose of depositing its spawn. We know, from the observations of Mr. Peach, that *Lamellaria perspicua* resorts to the shore between tide-marks at Wick, every spring, and makes a nidus for its spawn in *Leptoclinum punctatum*, one of the compound Tunicata. But *Lamellaria* is not, like *Stilifer*, restricted to a particular habitat. The former attaches itself to the underside of loose stones, and is also found generally distributed over the sea-bed, except perhaps in the spawning-season. Very few individuals of the species of *Echinus* on which *S. Turtoni* has been taken are covered with spawn; and *Stilifers* of all ages, from one to half a dozen, occur on *Echini*, and nowhere else. The Shetland specimens are larger than those from Plymouth. One found by Miss Backhouse is said to be $\frac{3}{8}$ of an inch long; I have not seen it. Mr. Alder has failed to detect, notwithstanding repeated examination, any traces of a denticulation or spinous tongue. He says that "the otolites are circular, with a central dot, that the gill consists of a single series of triangular lobes, and that the mouth breaks up into squarish angular fragments, not crystalline, perhaps horny."

The name of the present species has been spelt in two ways. We have *S. Turtoni* of Broderip and *S. Turtonii* of Lovén. The former seems to be correct, according to a precedent of inverted translation which we find in the case of Galenus becoming Galen. I am not aware, however, of any rule for Latinizing modern proper names. Euphony is often consulted in such matters, and is preferable to pedantry—although it would certainly be desirable to have a uniform mode of spelling. Some purists contend that the specific name given by the discoverer, if subsequently adopted as generic, ought to be also retained; so that our shell would be *Stilifer stilifer*. Examples of such a reduplication of the name under similar circumstances occur in *Volva volva* and *Turricula turricula*. But it would be very inconvenient to substitute the generic name for that of *Turtoni*, which is so familiar to all conchologists,—to say nothing of the inelegance of this method of nomenclature, or of its being contrary to one of the rules recommended by a committee of the British Association. Dr. Johnston called this species *Stylifer globosus*, and Brown *Stylifer astericola*: the latter confounded it with the tropical species of that name.

Family XIX. EULI'MIDÆ, H. & A. Adams.

This, too, is a case where the description of the typical genus will suffice. I do not know any other; *Leiostraca*, H. & A. Adams (not *Leiostracus*, Albers), which has *Eulima bilineata* for its sole representative, is undistinguishable from *Eulima*.

Genus EULI'MA*, Risso. Pl. III. f. 3.

Body spiral and smooth: *mantle* having a rudimentary branchial fold: *snout* forming a bilobed flap or mentum: *proboscis* long, cylindrical, and retractile; it consists of an outer and inner tube: *tentacles* awl-shaped, approximating at their bases: *eyes* almost sessile, placed at the external bases of the tentacles, or nearly behind them on the neck: *foot* lanceolate, double-edged, as well as truncated and usually bilobed in front: *gills* supposed to consist of a single plume. No tongue. Male organ small, flat, and curved like a sickle.

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* A compound of a Greek and a Latin word, signifying finely polished.

SHELL awl-shaped, many-whorled, polished and lustrous, not umbilicate: *spire* finely tapering to a regular point, with an extremely slight suture or line of separation between the whorls: *mouth* pear-shaped; lips discontinuous: *operculum* horny, with a short and incomplete spire, having its nucleus on the columellar or inner side.

From the absence of a spinous tongue, or "odontophore," it may be inferred that the mode of feeding is suctorial, as in *Odostomia* and *Stilifer*. It also shows that this organ is not indispensable for the classification of the Gastropoda. Forbes says that the animal of *Eulima* creeps with the foot greatly in advance of the head, which is almost always concealed beneath the front edge of the shell, the tentacles alone protruding. Scacchi and Philippi noticed the peculiarity of the eyes being apparently withdrawn, and peeping out under cover of the shell. The shell has an enamelled surface, shining like porcelain. There are many species, recent and fossil. None inhabit very high latitudes.

Other names of this genus are *Pasithea,* given by Dr. Lea, and *Balcis,* by Dr. Leach.

1. EULIMA POLI'TA*, Linné.

Turbo politus, Linn. S. N. p. 1241. *E. polita,* F. & H. iii. p. 229, pl. xcii. f. 1, 2, and (animal) pl. KK. f. 3 *a*, 3 *b*.

BODY whitish; front tinted with pale yellow, and more or less speckled with golden-yellow or bright orange: *mantle* fleshy, with a plain margin, not reflected over any part of the shell: *snout* or mentum flattish, not much extended, marked with a golden-yellow streak, like the letter V inverted: *proboscis* strap-shaped: *tentacles* short, but slender, and pointed, slightly diverging outwards; every part except the base is streaked lengthwise with golden-yellow or orange, and the whole is covered with a transparent gelatinous sheath: *eyes* large, black, and round, placed close together on slight and minute eminences, each of which is encircled by a ring of golden-yellow, on a level with the base of the tentacles; this part is seldom protruded, although the eyes are conspicuous through the shell: *foot* small and mostly short, squarish and broader in front, with angular corners or lobes edged with yellow, narrower towards the middle, and sharply rounded behind; the inner fold or groove formed by the front edges is closely lined with vibratory cilia in constant and rapid motion; sole flake-white, slightly furrowed down the middle: *gill* or branchial plume small, narrow and finely pectinated, having 12–15 short strands with a central vein; it issues on the left side and ascends obliquely to the right: *liver* purplish.

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* Polished.

Shell club-shaped, solid, opaque, and extremely glossy: *sculpture*, none if examined with a hand lens; but the microscope shows the entire surface to be covered with countless and close-set longitudinal striæ, which are crossed by less numerous and distinct but equally fine spiral lines, so as to produce a partial decussation; the periphery is more or less keeled or angulated, especially in immature specimens: *colour* ivory-white: *spire* long, somewhat cylindrical, and sharp-pointed; the upper part is occasionally curved: *whorls* 15–18, nearly flat, compact and gradually enlarging, except the last, which occupies about one-third of the spire; the first is semiglobular, and it appears to be inverted and to have a bright spot or nucleus in the centre: *suture* slightly oblique, defined more by the darker colour of the line where one whorl envelopes the periphery of the next above it than by any groove: *mouth* acute-angled above, widening and expanded below; its length equals about one-fourth of the shell: *outer lip* flexuous, with a rather thick edge, not inflected on the periphery, but sloping from it downwards: *inner lip* consisting of a broadish porcellanous deposit, which is considerably thickened behind the pillar; this last is flexuous: *operculum* thin, pale yellowish-horncolour, marked with microscopical and numerous flexuous striæ in the line of growth. L. 0·75. B. 0·2.

Habitat: Every part of the British seas, from Unst to Jersey, in muddy sand, 7–50 f.; Mull of Galloway 145 f. (Beechey). Fossil in post-glacial beds, Norway, 50–80 ft. (Sars), Red and Coralline Crag (Wood), Sicily (Deshayes and Philippi), Miocene formation near Vienna (Hörnes). It ranges from Finmark (Sars) to the Ægean (Forbes), at depths varying from 2–80 f.

A closely allied species, from Puget Sound, has been described by Dr. P. Carpenter, in the 'Proceedings of the Academy of Natural Sciences of Philadelphia' for 1865, as *E. micans*; respecting which he observes, "An *E. politæ* varietas Pacifica?"

This would be a beautiful object for the aquarium, with its pencilled tentacles, golden markings, and its bright eyes peering through the porcelain shell, which slowly trails along the ground. The spire is seldom perfect: the top whorls, being useless, are broken off; and the truncated portion is covered by a shelly plate, formed by the hindmost lobe of the mantle. I have a specimen containing the animal, but having only three whorls left. Sometimes the shell exhibits several varices, caused by a repetition of the outer lip at successive periods of growth. My largest example is more than an inch long and of proportionate breadth.

It appears to be the *Turbo lævis* of Pennant, and is the *Strombiformis albus* of Da Costa, *Rissoa Boscii* of Payraudeau, *E. elegantissima* (and perhaps also *E. glaberrima*) of Risso, *Melania Gervillii* of Collard des Cherres, and *E. anglica* of G. B. Sowerby.

2. E. INTERME'DIA*, Cantraine.

E. intermedia, Cantr. Mal. Méd. (Suppl.) p. 14.

BODY milk-white: *mantle* rather thin; edges even with the mouth of the shell: *tentacles* cylindrical, rather short and diverging, with blunt tips: *eyes* small and black, placed close together on short bulbs; they are always conspicuous (and open; do mollusks ever sleep?); each is encircled by a dark-orange disk: *foot* shortish, slightly cloven in front, and bluntly pointed behind, expanded towards the sides.

SHELL smaller than *E. polita*, having a narrower base, and consequently more spindle-shaped; it is not quite so solid, and live specimens are semitransparent: *sculpture* consisting of extremely fine and obscure microscopical spiral lines only; there is no peripheral keel at any stage of growth: *colour* less white in live specimens: *spire* proportionally shorter, and never twisted: *whorls* 15–16, more compact and less flattened than in the other species: *suture* marked by a broad clear band: *mouth* narrower: *outer lip* rather more deeply sinuated above: *inner lip* slighter and thinner. L. 0·45. B. 0·125.

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* Intermediate, *i. e.* between *E. polita* and *E. distorta*.

Var. *rubro-tincta.* Half the usual size and sometimes a little curved; upper part exhibiting the pink ramifications of the liver.

HABITAT: With the last species, from 20 to 73 f., in Shetland (J. G. J.); west of Scotland (Barlee, Norman, and J. G. J.); Coquet and Berwick Bay (Mennell); Arran Isles, co. Galway (Barlee); Cork (Humphreys); Exmouth (Clark); Plymouth (Barlee); Falmouth (Miss Vigurs, *fide* Cocks); Guernsey (Barlee and J. G. J.). The variety occurs in Loch Fyne, Shetland, and the Channel Isles. Red Crag at Walton-on-the-Naze (Wood); Palermo (Philippi); tertiaries of Sienna and Pelora (Cantraine); upper Miocene at Biot near Antibes (Macé). Distributed in a living state along the coasts of the North Atlantic, from Finmark (Sars) to the Canary Isles (M'Andrew), and throughout the Mediterranean (Cantraine, Philippi, and others) and Adriatic (Brusina) to the Ægean (Forbes); the recorded depths range from 15 to 60 f.

The animal floats; and it remains suspended in that posture, by means of a byssal thread, the operculum then closing the mouth of the shell. It differs from that of *E. polita* in the tentacles being white instead of tipped with orange; nor has the head-flap any coloured V-shaped mark. The upper whorls of the shell are empty in this and every other species of *Eulima* that I have observed in a living state.

I am inclined to refer to this species the *E. subulata* of Risso. Philippi described and figured our shell as *E. nitida,* under the impression that it was the *Melania nitida* of Lamarck; but that is much more slender, and belongs to the Paris Basin. Although all the colourless *Eulimæ* are much alike, it must not be forgotten that the fauna of the Eocene period was very different from that which now exists in temperate latitudes.

3. E. DISTOR'TA*, Deshayes.

Melania distorta (Desh.), Philippi, Moll. Sic. i. p. 158, t. ix. f. 10. *E. distorta*, F. & H. iii. p. 232, pl. xcii. f. 4, 5, and (animal) pl. KK. f. 4.

BODY whitish, mottled with reddish-brown [“rubrum” (Philippi); “yellow, beautifully variegated with carmine, which forms an irregular band on each side” (Alder); “flake- or pure white, and the anterior part of the body is marked irregularly with 15–20 distinct minute red dots” (Clark)]: *snout*, or mentum, narrow and projecting beyond the foot: *tentacles* long and slender, placed close together at their origin, and diverging at an acute angle [“white” (Alder); “the bases and about a third of their lower parts of a brilliant vermilion colour” (F. & H.)]; tips flake-white, and bulbous: *eyes* black, placed on slight bulgings of the tentacles at their outer base [“parvos” (Philippi); “very large” (Alder)]: *foot* elongated, rounded in front, and bluntly pointed behind: [*liver* “green” (Alder); “yellow, red, pink, light-green and white” (Clark)].

SHELL much smaller, slenderer and thinner than either of the foregoing two species; it is nearly transparent: *sculpture*, none to be detected, even by the aid of the microscope: *colour* clear white: *spire* narrow, more or less curved, so as to give the shell a distorted appearance: *whorls* 10–15, flattened: *suture* marked by a fine line: *mouth* as in *E. intermedia.* L. 0·2. B. 0·05.

Var. *gracilis*. Rather larger, more tapering, and scarcely (if at all) distorted. F. & H. iii. p. 233, pl. xcii. f. 6.

HABITAT: Widely diffused (although local) from low-water mark of equinoctial tides in rock-pools, among

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* Distorted.

Zostera and under stones, at Jersey, to a sandy bottom in the greatest depths of the North Sea. The variety inhabits deep and sheltered water at Oban, and in Loch Fyne and Shetland. Sars has enumerated this species as a post-glacial fossil from a shell-bank at Kirköen in Norway, 50 feet above the present level of the sea, and Calcara from Altavilla in Sicily; Macé found the variety in an upper Miocene bed at Biot near Antibes. Both the typical and varietal forms are generally distributed in the North Atlantic, from Finmark to the Canaries, as well as throughout the Mediterranean, Adriatic, and Archipelago, at depths of from 10 to 140 f. A Mazatlan shell in Mr. M'Andrew's collection, from Dr. P. Carpenter, cannot be distinguished from ours.

This species was evidently known to Montagu; for he says, "minute specimens [of *E. polita*] are sometimes found on oysters and scallops. In this infant state they are of exquisite polish, and when the animal is alive, frequently appear mottled with pink and pale-green; are also somewhat arcuated and very seldom found perfectly straight." The discrepancies in the several descriptions of the animal which I have collated show a considerable variation of colour; Clark's and mine agree best with that of Philippi in Wiegmann's Archiv for 1841, viz. that the body is ornamented with purple-red or crimson confluent spots and points, which colouring extends to the base of the tentacles. The animal is agile, and swims well for a mollusk. Malm tells us that the easiest way to procure specimens is by allowing the dredged silt to stand in a tub for an hour, when they may be seen floating on the surface of the drained water. The shell is sometimes truncated to such an extent as to have only four whorls left, the uppermost being plugged off.

I consider this species to be the *Rissoa sinuosa* of Scacchi, although Philippi makes that a synonym of his *E. nitida*. Chiereghini named it *Turbo curvatus*, and Leach *Balcis arcuata*. Macgillivray mistook it for *E. polita*.

4. E. STENO'STOMA*, Jeffreys.

E. stenostoma, Jeffr. in Ann. & Mag. N. H. 3rd ser. ii. p. 128, pl. v. f. 7.

BODY milk-white: *mantle* thin, stippled with brown: *snout* crescent-shaped, bilobed, flexible, and transparent, projecting a little beyond the foot: *tentacles* rather long and slender, with rounded tips; they diverge at an angle of about 25°; at the base of each is a patch of flake-white: *eyes* entirely wanting in all the specimens (at least a dozen) examined by me at different times: *foot* broad, squarish, and slightly bilobed in front, narrowing behind to a bluntly rounded point.

SHELL spike-shaped, slender, thin, transparent, glossy and of a brilliant lustre: *sculpture*, extremely slight and close-set spiral lines, which are discernible only under the microscope and in certain lights; the surface when examined by the aid of a strong lens or hand magnifier appears quite smooth and polished: *colour* milk-white: *spire* elongated, ending abruptly in a blunt and semiglobular point: *whorls* 9, drawn out and gently swelling; the last occupies nearly one-half of the spire: *suture* oblique, defined by a rather broad hem or border of flake-white, which is encircled underneath by a clear and narrow line; this hem or border arises from a thickening of the shelly material to form the suture or commissure: *mouth* narrow, extending from a sharp angle above to an expanded and rounded base; the inner or columellar side represents a very obtuse angle: *outer lip* flexuous, with a rather thin edge, receding at the top and advancing outwards towards the base: *inner lip* reflected and twisted over the lower part of the pillar: *operculum* filmy, pale yellowish-horncolour, marked with slight flexuous striæ in the line of growth. L. 0·35. B. 0·085.

HABITAT: Fine sandy mud, in 75–90 f., 45–50 miles S.E. by E. of the Whalsey Skerries, Shetland (J. G. J.); 30 miles off the same coast, in 82 f. (M'Andrew). Upper Norway (Lovén and M'Andrew).

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* Having a narrow mouth.

It is as beautiful as it is scarce. The animal is active, and will not stay in the water. Ovary of a bright pink hue; I did not observe it in every individual. The liver is orange. No eyes could be detected, although they were very conspicuous in specimens of *E. distorta* and *E. bilineata* (both of smaller size than the present species) taken at the same time and from the same ground; nor could such organs be subcutaneous, because the tissues of the animal are transparent and were thoroughly examined. The shell resembles a large *Achatina acicula*.

5. E. SUBULA′TA*, Donovan.

Turbo subulatus, Don. Br. Sh. pl. clxxii. *E. subulata*, F. & H. iii. p. 235, pl. xcii. f. 7, 8.

SHELL awl-shaped, rather thin, semitransparent, of a polished lustre: *sculpture*, numerous fine spiral lines, visible only under the microscope; examined as a transparent object, the texture appears delicately stippled in the line of growth: *colour* yellowish-white, variegated by narrow tawny spiral bands, which are arranged on the body-whorl in 3 double sets or pairs, one below the suture, another round the periphery, and the third encircling the base; these sets are sometimes more or less confluent, so as to form single broad belts, or they diverge near the mouth, in which latter case the outer edges unite and the bands are not continued to the outer lip; each of the succeeding six whorls has only 2 bands: *spire* tapering to a fine point: *whorls* 12–13, rounded but compressed, the last occupying about three-sevenths of the spire: *suture* oblique, defined by a narrow dark line: *mouth* contracted, acute-angled above, and rounded but not much expanding below; edges thickened: *outer lip* folded inwards at the upper part, and slightly flexuous: *inner lip* reflected over the whole pillar, which is decidedly flexuous: *operculum* very thin, pale drab, and rather coarsely striated. L. 0·5. B. 0·1.

HABITAT: Coralline zone in Devon, Dorset, and Cornwall (Da Costa and others); estuary of the Dee (Collingwood); Isle of Man, 25 f. (Forbes); Scarborough (Bean); Anglesea (M'Andrew); Bantry Bay, sometimes in the gizzard of *Scaphander lignarius* (Humphreys); dredged off Cork (M'Andrew); Youghal and Dublin (Ball, *fide* Thompson); Dundrum, co. Down (Thompson); Orkneys, 12 f., and Shetland, 5–90 f. (Forbes). I suspect that all the more northern localities should be referred to *E. bilineata*, instead of to the present species. This is not the *E. subulata* of Searles Wood (a Crag shell), nor that of Nyst; and I doubt the identification with it of the species described and figured under the same name by Hörnes from the Miocene formation of Vienna. Our species occurs on all the coasts of France, Spain, Portugal, Italy, Dalmatia, Greece, and North Africa, from 2 to 140 f.; and M'Andrew has taken it near Madeira in 18–24 f. The Norwegian localities given by Lovén and Danielssen for this species probably belong to *E. bilineata*.

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* Awl-shaped.

It is the *Strombiformis glaber* of Da Costa. I do not know why all modern British conchologists have repudiated that specific name. Donovan, with more ingenuity than ingenuousness, misquoted his predecessor, and endeavoured to show that the latter had contravened the Linnean rule by making the specific name a sentence instead of a single word. But such was not the case; and Da Costa's description is quite as appropriate and complete as that of Donovan. However, since the older name has never been adopted, I will not revive it. Payraudeau called it *Melania Cambessedesii*, G. B. Sowerby *E. lineata*, Forbes *Melania Donovani*, Renieri *Turbo fasciatus*, Mühlfeld (according to Philippi) *Helix flavocincta*, and Leach *Balcis testacea*. *E. subulata* of Risso and Delle Chiaje differ from this and from each other.

6. E. BILINEA′TA*, Alder.

E. lineata (as probably of Sowerby, but proposed to be changed to *bilineata*), Ald. Cat. Moll. North. & Durh. in Trans. Tyn. Nat. Field Club, p. 47. *E. bilineata*, F. & H. iii. p. 237, pl. xcii. f. 9, 10, and (animal) pl. KK. f. 5.

Body whitish, with a faint tinge of yellow: *snout* rather narrow, seldom projecting beyond the foot: *tentacles* rather long: *eyes* small and black, persistent after death, when they are distinctly seen through the shell: *foot* having a slight ear-shaped expansion at each corner in front, finely pointed behind.

Shell a miniature resemblance of *E. subulata*, with 10–11 whorls. It is proportionally more solid and not so slender; and the coloured bands are fewer and differently arranged. The present species has a well-marked pair of bands round the middle of the last whorl, besides sometimes an obscure band just below the suture; and the upper whorls are encircled by a pair, or occasionally by a single band. The pair on the body-whorl converge (instead of diverging) towards the mouth. There is also in some specimens a tawny streak or blotch at the base (apparently representing the lowermost set of bands in the allied species), which stains the lower part of the pillar-lip. The mouth is not so narrow, and the outer lip is more flexuous. L. 0·3. B. 0·075.

Habitat: Locally but widely dispersed, from low-water mark at Jersey under loose stones (Dodd), to 82 f. off the east coast of Shetland in muddy sand (J. G. J.). Montagu and many other writers mistook it for a small variety of the last species; and the published accounts of its distribution are therefore somewhat confused. The present species has been taken by Lovén, Sars, M'Andrew, and Malm on the Scandinavian coasts, at depths of from 15 to 200 f.; and Martin found it among the refuse of fishing-boats in the Gulf of Lyons. I have verified all these instances of foreign localities.

The animal crawls at a tolerably fast pace, and gets out of the water whenever it is immersed. My largest specimen is not quite $\frac{4}{10}$ of an inch long. The relation of this species to the last appears to be nearly similar to that which *Tellina pusilla* bears to *T. donacina*.

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* Having two thread-like marks.

Family XX. NATI'CIDÆ, Swainson.

Body spirally rolled into a more or less globular form: *mantle* rather thin: *snout* (or mentum) wedge-shaped, forming part of the front lobe of the foot: *proboscis* long and retractile, usually concealed: *tentacles* triangular, flattened, and pointed, widely separated, and pressed against the front of the shell by the anterior flap or extension of the foot: *eyes* either immersed in the skin (one at the outer base of each tentacle, and very small) or wanting: *foot* thick and largely developed, folded back over the front of the shell in the shape of a broad flap or hood, and behind over the base of the shell, so as to cover the greater part of it: *gills* divided into 2 plumes: *odontophore*, or lingual riband, short and straight [rhachis 1-toothed; pleuræ having 3 uncini (Lovén)]. Sexes distinct: *verge* sickle-shaped.

Shell globular or inclined to oval, smooth or finely striated in a spiral direction: *spire* blunt, usually very short: *epidermis* slight: *mouth* large, semicircular: *outer lip* thin: *operculum* ear-shaped and few-whorled, with the spire on the inner side of the mouth, near the base of the pillar.

In general aspect the animal resembles that of the *Bullidæ*, especially in the hood-like expansion of the foot in front. But other parts, as well as the shell, are dissimilar; so that the relation of the two families may be merely one of analogy, such as occurs in many distinct groups of the Mollusca whose habits of life are the same. Both these families are zoophagous. The *Naticidæ* live in sand. While preying on weaker shell-fish, they are in their turn devoured by the flounder, haddock, and cod. It is geologically an ancient family, dating (according to M. Pictet) from the upper Silurian epoch. De Blainville called it *Hemicyclostoma*, Menke *Sigaretea*.

Genus NA'TICA*, Adanson. Pl. III. f. 4.

For generic characters see those of the family.

I thought of separating one species (*N. Islandica*), because it has a thinner shell and scarcely any umbilicus, and of adopting the genus *Globulus* of Sowerby, or *Bulbus* of Brown (not of Humphreys), for which Mörch lately substituted *Amauropsis*. But in all other characters, both of animal and shell, it agrees with *Natica*; and I have therefore considered it best, on the whole, not to increase the number of genera.

Probably the *νηρίτης* of Aristotle, which Casaubon interpreted as *natex*. The shell was merely enumerated by Aristotle among univalves, and said to be inhabited by a kind of hermit crab. Of Nerites it is fabled that he was the son of Nereus and Doris, and that Venus, indignant at his refusal to accompany her to Heaven, metamorphosed him into a beautiful shell. Pliny would have us share his marvellously facile belief that the nerite swims with the mouth of its shell uppermost, raising the front or outer lip to serve as a sail, and thus catching the breeze. The word *natice* is therefore supposed to be derived from the natatory habit of this shell-fish, according to the Bolognese Professor, Aldrovandi, the fruit of whose laborious investigations of the natural history known to the ancients was not inferior to the similar compilation of Pliny. *Natica* seems thus to have acquired the vernacular synonyms of "Schwimmschnecke" in the German, and "svömskiæl" in the Danish language. The pretty spots with which some species of *Natica* (e. g. *N. millepunctata*) are ornamented attracted the attention of Olivi, who, in his 'Zoologia

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* Perhaps an emendation of the word *natice*, given to this shell by Aldrovandi, and derived from its supposed natatory habit.

Adriatica,' endeavoured to explain the action of light and temperature on the colouring-glands of the Mollusca; but, although the development and intensity of colour may be stimulated by the above-mentioned agents, his conjectures contributed nothing to the elucidation of a problem so difficult as this. The observations of Baldassini ('Memoria sopra le conchiglie considerate come parte integrante del corpo dei molluschi') show that the intensity of colour in a shell depends on the age, food, and health of the mollusk. Gould says that the *Naticæ* are very voracious, and play a conspicuous part in devouring the dead fish and other animals which are thrown up by the tide. The small circular holes with which bivalve shells are often drilled are also (according to him) the work of these Gastropods, and made by them to gain an entrance to the animal apparently so well secured against such a foe. Their foot is so large as to completely envelope their prey. When moving, they burrow just below the surface of the sand; and their resting-place is generally indicated by a small heap, resembling that made by a mole. The foot is permeated by numerous tubular canals or vessels, which absorb water like a sponge (probably through pores opening inwardly) and thus cause this organ to be enormously distended. Mr. Osler suspected, with scarcely any reason, that *Natica* and *Ianthina* are insectivorous; he imagined that the foot of the one and the float of the other might be baits to attract the prey which these mollusks were unable to pursue! The eyes, when present, are subcutaneous, and have escaped the notice of most naturalists; those of *N. Alderi* have been described by Mr. Clark. Being always covered, they can be of little, if any, use as organs of vision. The nidus or matrix of the spawn is strap-shaped and convoluted, assuming a quoit-like form; it is of a gelatinous consistency, but rendered tolerably firm by the admixture of grains of sand. These curious bodies may often be seen lying on the sand at low water of spring-tides in summer. They have been mistaken for zoophytes, and were placed by Solander and Ellis in the genus *Flustra*, by Pallas in *Eschara*, and by Lamarck in *Discopora*. "The cells are arranged in quincunx order" (Gould).

The Rev. L. Guilding (Linn. Trans. vol. xvii.) divided this genus into *Natica* and *Naticina*, the former having a shelly, and the latter a horny operculum. Gray proposed to adopt the genus *Neverita* of Risso for the species with a horny operculum; but Risso retained *Natica* for these, and his description and figure of *Neverita* represent a different kind of shell (apparently *Natica olla*), which has the umbilicus closed by a solid pad. In all our species the operculum is horny. Reeves's list contains 137 recent species of *Natica*. There are many obsolete generic synonyms.

A. Shell rather thin, with a produced spire; umbilicus small.

1. Natica Islan'dica*, Gmelin.

Nerita Islandica, Gmel. ed. S. N. p. 3675. *Natica helicoides*, F. & H. iii. p. 339, pl. c. f. 6.

Body pale yellowish-white, minutely and closely speckled with flake-white: *snout* broad and large, with rounded corners: *tentacles* small; they either project at the sides of the front foot-lobe, or are pressed back by it on the outer lip of the shell: *eyes*, none observable: *foot* narrower at the sides, expanded and forming short ear-shaped lobes in front, thicker and folded back behind into an angular point.

Shell conic oval, less solid than any other recent British species of *Natica*, semitransparent, not glossy when fresh and covered with the epidermis; base somewhat attenuated and angular: *sculpture*, apparently none; but the lens discloses numerous slight spiral striæ, irregularly disposed and often wavy; by the aid of a microscope may also be seen much more numerous and still finer lines of growth, which, however, do not produce any decussation of the surface: *colour* milk-white under the *epidermis*, which is pale-yellow or lemon-colour in young specimens, brownish-yellow in the adult: *spire* turreted, abruptly and bluntly pointed: *whorls* 5–7, rounded but compressed; the last occupies nearly five-sixths of the spire; the first is very minute, and scarcely projects beyond the second: *suture* rather oblique, deeply and conspicuously channelled or grooved inwards, so as to leave a narrow ledge at the top of each whorl and to give the appearance of their partly overlapping one another: *mouth* equal in area to one-third of the shell, and in length to two-thirds of the spire, expanding and somewhat angulated at the base: *outer lip* incurved above, and joining the *inner lip*, which is spread over the pillar and almost conceals a narrow and small umbilicus: *operculum* thin, golden-yellow, minutely, very finely, and closely striated in the line of growth; whorls 4, defined by a raised edge or rim, the last disproportionately large. L. 1. B. 0·65.

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* Icelandic.

HABITAT: Rare, in the coralline zone, from 7 to 79 f., Shetland (Barlee, M'Andrew, and J. G. J.); Orkneys (Thomas); Wick (Peach); Aberdeenshire (Macgillivray, Gordon, and Dawson); Banff (Edwards); Firth of Forth (Knapp); Berwick Bay (Johnston); Northumberland coast (King); Sunderland (Howse); Scarborough (Leckenby); Cork (Humphreys). In most of these cases the specimens were caught by fishermen, or taken from the stomachs of haddocks. It occurs in most of our quaternary or post-glacial beds in Scotland, Ireland, and Yorkshire; Norwich and Red Crag (Lyell and S. Wood); Uddevalla (Lyell and others); Christiansund, 30–40 feet (Sars); Gardiner, in the State of Maine (Lyell). Recent in Scandinavia, Iceland, Faroe Isles, coasts of Russian Lapland and the White Sea, Spitzbergen, Greenland, Massachusetts northwards to Canada, Icy Cape, and Behring's Straits, at depths ranging from 3 to 60 f.

It is more sluggish than any of the other *Naticæ* which I have examined. A specimen dredged by Mr. Barlee and myself in Shetland is more than an inch and a half long and an inch broad. Mr. Edwards of Banff got another specimen nearly as large from the stomach of a cod.

Olafsen and Povelsen accurately described this shell in the account of their journey through Iceland, 1772. The Latin part of this description was republished by Müller and Gmelin; and the latter gave a name to the species. It is the *N. helicoides* of Johnston, *N. canaliculata* of Gould (not of Lamarck), *N. exulans* of Lovén's MS. (according to Gould), and *N. cornea* of Möller.

B. Shell more or less solid, with a short or compressed spire; umbilicus of various sizes.

2. N. GRŒNLAN′DICA*, Beck.

N. grœnlandica (Beck), Möller, Ind. Moll. Gr. p. 7. *N. pusilla*, F. & H. iii. p. 341, pl. c. f. 7.

BODY creamcolour: *tentacles* very short: *eyes* not perceptible, if any: *foot* smaller than in many other species.

SHELL globose, resembling that of typical species of *Helix*, moderately solid, almost semitransparent, lustreless: *sculpture*, consisting only of extremely fine and obscure spiral striæ and equally minute but more numerous lines of growth: *colour* white under the *epidermis*, which is creamcolour: *spire* short, slightly prominent: *whorls* 4–5, tumid; the last occupies eight-ninths of the spire; apex always eroded: *suture* nearly straight, very narrowly excavated inwards: *mouth* equal in area to one-third of the shell, and in length to five-eighths of the spire, expanding and rounded or slightly angulated at the base: *outer lip* somewhat incurved above, and having a bevelled

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[*] Inhabiting Greenland.

edge: *inner lip* broad, considerably thickened on the lower part, and forming a callous ridge just below the junction of the outer lip with the periphery; it is reflected over the pillar and a great part of the *umbilicus*; this is narrow, and further contracted by a broad and obliquely twisted buttress, issuing outwards towards the base from the centre of the cavity on the side of the pillar: *operculum* thin, lemoncolour, closely and irregularly striated in the line of growth, and marked in every direction with microscopical short and curved scratch-like lines; spire irregular, defined by a broad chalky-white suture, and terminating in a minute nucleus. L. 0·85. B. 0·85.

Habitat: Not uncommon in muddy sand, at a considerable distance from the coasts of Northumberland, Durham, and Yorkshire, in 40–60 f. (Bean and others); Shetland (Barlee). Fossil in the Scotch "drift" formation (Smith and others); 20–25 f. on the Turbot-bank, co. Antrim (J. G. J.); Bridlington (Wood); Kelsey Hill, near Hull (Prestwich); Norwich Crag (Woodward); Uddevalla (J. G. J.); glacial and post-glacial beds in Norway, the former at 0–460 and the latter at 30–40 feet (Sars); "post-pliocene" deposits, Canada (Dawson). Recent on the coasts of Scandinavia, Faroe Isles, Iceland, Greenland, White Sea, and Sea of Okhotsk, north-east and south-west America, from the shore to 150 f.

It appears to be a delicate animal, as it soon dies when kept with other and more hardy mollusks. The fishermen at Staithes call it the "white snail." Mr. Howse tells me that it takes the bait freely, and that, when the lines are drawn, it gripes or drives the hook into its body and is thus caught. Very young specimens of this *Natica* have a semicircular pad on the outside of the pillar, which projects over the umbilicus and covers part of it; this grows into the buttress or ridge-like process mentioned in my description of the shell.

It is the *N. pusilla* of Gould, but not of the original describer, Say, which latter species is oval and very much smaller than ours, having a calcareous operculum and the umbilicus completely closed by a pad. *N. nana* of Möller appears to differ from Say's shell merely in having a horny operculum. Our shell is the *N. livida* of Bean, *N. borealis* of Gray, *N. Gouldii* of Philippi, *N. alba* and *N. lactea* of Lovén's MS. according to Philippi, and *N. bulbosa* of Reeve; probably also the *N. Beverlii* of Leach, being one of the "invertebrate animals discovered by His Majesty's Ship Isabella" [!], and described in 'Sir John Ross's Voyage to Baffin's Bay.' It is difficult to decide, from the too short diagnosis given by Broderip and Sowerby, whether their *N. pallida* is the present species or *N. Islandica*. Mörch placed *N. Grœnlandica* in the genus *Mamma* of Klein, an olla podrida of *Nerita, Natica, Dolium, Buccinum, Turbo,* and *Purpura*. We cannot say of such systematists, "Et quo antiquius, eo melius."

3. N. SOR'DIDA*, Philippi.

N. sordida, Phil. Moll. Sic. ii. p. 139, t. xxiv. f. 15; F. & H. iii. p. 334. pl. c. f. 5, 8, and (animal) pl. PP. f. 3.

BODY fleshcolour or pale tawny: *snout* strong and very large, whitish except at the extremity, which is reddish-brown: *tentacles* having fine and tapering points: *eyes*, none perceptible: *foot* enormous, very slimy, truncated or cloven in front, and rounded behind.

SHELL globose, inclining to oval, thick and solid, opaque, somewhat glossy: *sculpture*, minute, irregular, flexuous, and slight spiral lines, which are stronger or more conspicuous below the suture of the body-whorl and on the base: *colour* buff, passing into chestnut: *epidermis* thin, of a lighter shade than the main colour of the shell: *spire* short, slightly prominent; apex abraded or decorticated: *whorls* 5–6, tumid and rapidly enlarging; the last occupies ten-elevenths of the spire; the upper part of each (especially of the body-whorl) is compressed or sometimes flattened, so as to present a bluntly angular edge in front: *suture* rather straight, very narrowly excavated inwards: *mouth* equal in area to nearly one-third of the shell, and in length to two-thirds of the spire, expanding and decidedly angulated at the base: *outer lip* gently incurved above, and having a blunt edge: *inner lip* broad and remarkably thick, forming above a callosity or small protuberance, which is separated from the outer lip at its origin by a short and shallow groove; it is reflected over the pillar and upper part of the umbilicus, and has a stain of pale chocolate; the middle portion is spread further backwards and forms an angular pad: *umbilicus* rather large and deep, for the most part open; a broad ridge winds spirally inwards down the centre and towards the base of the shell; it exhibits also two or three parallel indistinct grooves and some striæ: *operculum* horncolour, narrowly edged with pearl-white, microscopically and closely striated in the line of growth; last whorl (as usual) excessively large, defined by a white overlapping suture; termination or nucleus of the spire concave. L. 1·3. B. 1·2.

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* Dirt-coloured.

HABITAT: Muddy sand in 7–90 f., Shetland (M'Andrew, Barlee, and J. G. J.); west of Scotland (Forbes and others); Moray Firth (Gordon); Firth of Forth (Knapp); Dunbar (Laskey); Exmouth, dredged with *N. catena* (Clark); St. George's Channel, between Scilly and the Smalls (M'Andrew); Lough Strangford (Dickie); Dublin Bay (Kinahan); Youghal (Miss E. Ball, *fide* Thompson); Cork (Humphreys); between Cape Clear and Baltimore (M'Andrew); Arran Isle, co. Galway (Barlee). Fossil in the south of Italy and in Sicily (Philippi); Coralline Crag (Wood, as *N. cirriformis* of Sowerby and probably *N. proxima*). Its foreign range in a living state appears to be entirely southern, viz. south-west of France (Fischer); Gibraltar, 12 f., and Malaga, 30 f. (M'Andrew); Corsica (Susini); Naples and Palermo (Scacchi and Philippi); Algiers, caught by a fishing-line in deep water (Weinkauff).

In Shetland also it occasionally takes or sucks the fish-baits. Its horny jaws are large; and when expanded they form a triangular plate. The size of my largest specimen is $1\frac{6}{10} \times \frac{5}{10}$ inch. This species differs from *N. Grœnlandica* in size, solidity, colour, and the umbilicus.

It is perhaps the *Nerita lævida* of Laskey (Mem. Wern. Soc. i. p. 409), who says, "It bears some resemblance to *N. glaucina* [*N. catena*], but has a more produced apex, and is divested of the markings of that shell." It appears to be the *N. glaucina*? of Scacchi. Swainson's *N. sordida* is *N. plumbea* of Lamarck, an exotic species, to which Philippi erroneously referred the European shell.

4. N. CATE'NA*, Da Costa.

Cochlea catena, Da Costa, Br. Conch. p. 83, t. v. f. 7. *N. monilifera*, F. & H. iii. p. 326, pl. c. f. 1, and (animal) pl. PP. f. 6 (by mistake as *N. canrena*).

BODY yellowish or drab, with a purplish tinge on the upper part, and faintly lineated with purplish-brown: *snout* fleshy: *mouth* or orifice of the proboscis globular, small, lying underneath the snout: *tentacles* rather long, slender, and pointed, placed in the middle above the snout, and nearly concealed by the front lobe of the mantle: [*eyes* "so excessively minute as scarcely to be visible" (Clark):] *foot* very voluminous, and when at rest enveloping the greater part of the shell, divided across so as to form two unequal portions, the posterior of which is the larger, bluntly pointed behind; front lobe notched or indented in the middle: *male organ* situate under the right tentacle: *ovary* pale yellow: *liver* dull olive.

SHELL globose, and somewhat resembling an *Ampullaria* in shape, moderately thick and solid, opaque, glossy: *sculpture*, microscopical and very close-set flexuous spiral striæ: *colour* pale yellowish-white or buff, ornamented with a row of reddish-brown or light chocolate short, oblique, or zigzag, longitudinal streaks at the top of each whorl, and sometimes (frequently in immature specimens) with also one or two similar rows round the periphery of the last whorl: *epidermis* very thin, buffcolour, to be seen only within the umbilicus, having been rubbed off in other parts by the continual friction of the sand which this species inhabits: *spire* short, slightly prominent; apex entire, flattened: *whorls* 7, tumid and rapidly enlarging; the last occupies eleven-fourteenths of the spire: *suture* nearly straight, rather deep, and well defined: *mouth* of the same relative dimensions as in the last species, slightly expanding and angulated at the base: *outer lip* rather sharply incurved above, and having a blunt edge: *inner lip* broad, not very thick on the upper part of the pillar, forming a slight ridge along that corner of the mouth, and a white solid pad or callus in the middle, which projects over that side of the umbilicus; the inner layer is more or less tinged with reddish-brown, and sometimes also the inside rim of the upper part of the body-whorl: *umbilicus* rather large and deep, for the most part open, marked with several slight obliquely spiral grooves: *operculum* horncolour, microscopically and closely striated in the line of growth, giving a fibrous appearance; in other respects like that of *N. sordida*. L. 1·4. B. 1·4.

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* From its chain-like rows of spots.

Var. *conico-ovalis*. Spire somewhat elongated or drawn out.

HABITAT: Large sandy bays from Jersey (Dodd) to Unst (J. G. J.), at low-water mark of spring tides and down to about 10 f.; common. Shells inhabited by hermit crabs (which had probably carried them into deeper water) were dredged by Mr. Hyndman off the Mull of Cantire in 40 f., and by Professor Dickie in Lough Strangford, from 15 to 25 f.; this shows the advisability of recording in dredging-lists whether the species so procured were living or dead. A specimen of the variety was taken by me on Rossilly sands near Swansea; and M. Martin obtained the same variety on the coast of Provence. This species is said to occur in almost every upper tertiary fossiliferous bed in England, Scotland, and Ireland, including the deposit near Macclesfield, 500–600 feet (Darbishire), that on the Sussex coast (Godwin-Austen), Clyde beds (Smith), Mammalian and Red Crag (Wood). The account of its geological distribution is not satisfactory. *N. catena* does not appear to inhabit any part of the arctic seas, like other Mollusca whose remains are found in formations for that reason assigned to the glacial period. Moreover the coloured markings of this species are not exhibited in the Crag shells so named by Mr. S. Wood, although they are retained in his *N. millepunctata*. Its foreign range extends from Bohuslän (Lovén) to Corsica (Requien).

It was first described and figured by Lister, and is the "English chain-headed sea Button-shell" of Petiver. Specimens in Macgillivray's collection from Aberdeen measure full two inches in length and breadth. I dredged at Guernsey a small one the spire of which is reversed or sinistrorsal. The fry are globular, orange-colour, and umbilicate; they assume the purplish-brown markings after they are excluded from the leathery band noticed in my account of the genus, and which in the present case when dry looks not unlike a piece of thin Scotch oaten bread. Bouchard-Chantereaux informs us that the sexual coition lasts many hours; and that the spawn-envelope consists of a great number of rounded cells, each containing from 12 to 15 fry, which emerge in succession at an interval of two or three days after at least two months of fœtal life. The eggs are laid usually in March and April, and the young are produced in May and June. This mollusk was justly admired by Mr. Clark, who says, "When just taken, in vigour, and immersed in sea-water, it is scarcely possible to contemplate a more beautiful and interesting object, with its shell rising as a globular pyramid from its immense circular disk, elegantly marked with fine dark lines on a clear-drab ground." It is not always so sluggish as it seems. According to Mr. Bretherton ('Zoologist' for 1858, p. 6232) it crawls quickly in pursuit of its prey (chiefly *Mactræ* and *Tellinæ*), which it seizes by means of its large and flexible foot, and, after drilling their shells with its tongue, devours them while buried in the sand. This will account for most of the small round holes that are so often seen in bivalve shells thrown up on the beach. I am not disposed to concur in the opinion commonly entertained by naturalists that the front of the tongue is worn away by use. That portion is firmly and intimately connected with the jaws; and it would be difficult to explain how such a union could be dissolved or a new attachment formed from time to time. The present species differs from the last in its larger size and plumper form, the whorls not being compressed at the top, its deeper and wider suture, the umbilicus being grooved instead of ridged, and particularly in the coloured streaks and the different hue of the pad formed by the inner lip.

It is the *Nerita glaucina* of Pennant, Pulteney, and Donovan, but not of Linné, which is now considered a tropical species—although under that name Linné evidently included our shell with several others. Dale called it *Cochlea parva*, Forbes *Natica Nicolii*. Potiez and Michaud referred it to the *N. ampullaria* of Lamarck, Lovén to his *N. collaria*, Deshayes to his *N. castanea*, and Forbes and Hanley to his *N. monilifera*. Without discussing the question which, if any, of these Lamarckian species the one now under consideration may have been, I prefer following Alder and Searles Wood in adopting the older name given by Da Costa.

5. N. Alde'ri*, Forbes.

N. Alderi, Forb. Mal. Mon. p. 31, pl. ii. f. 6, 7. *N. nitida*, F. & H. iii. p. 330, pl. c. f. 2–4, and (animal) pl. PP. f. 5, as *N. Alderi*.

Body creamcolour, spotted or streaked with reddish- or purplish-brown: *snout* broad, thick, and flexible, margined by a line of purplish-brown: *tentacles* sharp-pointed, tipped or edged with the same colour: [*eyes* "distinctly visible, immersed in the centre of the anterior bases of the tentacula" (Clark):] *foot* expansile, minutely veined.

Shell conic-globose, inclining to oval, very thick and solid, opaque, glossy: *sculpture* numerous and minute lines of growth, which are not discernible without a magnifying-power; occasionally a few slight spiral striæ may also be observed: *colour* buff, adorned with spiral rows of reddish-brown or light chocolate spots and streaks; of these there are 5 on the body-whorl, and 1 on each of the next two or three whorls; all the rows except the middle one on the body-whorl (which is composed of short zigzag longitudinal streaks) are usually formed of blunt arrow-headed spots, the uppermost row being frequently more dark-coloured and conspicuous than the rest; the umbilicus and inner lip are also stained with reddish-brown or light chocolate: *epidermis* yellowish-brown and somewhat fibrous, preserved within the umbilicus only: *spire* short, but prominent, ending in a blunt point: *whorls* 6, convex, compressed, and shelving upwards towards the suture; the last occupies eleven-twelfths of the spire: *suture* oblique and slight: *mouth* equal in length to nine-twelfths of the spire, scarcely expanding, and bluntly angulated at the base: *outer lip* sloping from the periphery, and having a blunt edge: *inner lip* broad, forming a very thick ridge or callosity at the upper angle of the mouth, and a large thick pad in the middle, which is obtusely triangular and projects over the upper side of the *umbilicus*; this part is narrow and oblique, two-thirds open, separated on the lower side by a slight ridge, between which and the pad are some obscure and smaller ridges: *operculum* light-horncolour, striated as in the last species, and marked with a few indistinct revolving lines; spire defined by an overlapping and raised edge. L. 0·7. B. 0·65.

Var. 1. *lactea*. Shell milk-white.

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* Dedicated to Mr. Joshua Alder of Newcastle-on-Tyne, a distinguished British zoologist.

Var. 2. *subovalis.* Smaller, and of a somewhat oval shape, with a longer spire; fawncolour or whitish.

Var. 3. *ventricosa.* More globose, and short-spired.

HABITAT: Everywhere, in sand, from the extreme verge of low-water mark to the greatest depth within the line of soundings. Var. 1. Widely distributed, but not common. Var. 2. Shetland and west of Scotland, in deep water (J. G. J.); Silverpits on the north-eastern coast of England (Rich). Var. 3. Hebrides (J. G. J.). Fossil in many of our quaternary deposits (Smith and others); glacial and post-glacial beds in Norway, 0–440 feet (Sars). Its range, as a recent species, comprises the North Sea from the Loffoden Isles southwards, the western coasts of the North Atlantic, the Adriatic, and both sides of the Mediterranean; depths recorded from various places 5–80 f.

It glides swiftly along by means of its broad foot. Mr. Dennis writes me word that it is a very ravenous mollusk, and that, when placed in a basin of sea-water with *Scrobicularia alba* or other small bivalves, it will, as soon as night falls, pierce the shells and commence devouring its prey. The spawn-case is not so tough and leathery as that of *N. catena*; one now before me measures an inch and a quarter in diameter, the circular hole at the top being half an inch. The pad in very young shells covers about one-half of the umbilicus, although this latter part is nearly closed in some specimens from Shetland. The ground-colour varies from pure white to dark orange; occasionally the spots are confluent, or they are replaced by broad bands, or else by a white zone at the top of each whorl; now and then the upper whorls only are encircled by a single row of spots; and the streak outside the umbilicus is not unfrequently wanting. Specimens procured by Mr. Jordan at Falmouth not only exhibit an irregular style of colouring, but the last whorl has a tendency to diverge from the one above it in almost a scalariform fashion. The present species differs from *N. catena* in its smaller size and comparatively greater solidity, more produced and pointed spire, slighter suture, diversified arrangement of the coloured markings, and contracted umbilicus.

This species was described in the 'Fauna Suecica,' and in the second edition of that work bears the name of *Nerita glaucina*. It seems to have been mistaken by all the old writers on British conchology for the young of *Natica catena*. The *Nerita nitida* of Donovan is a common tropical shell. Indeed he admitted that the authority on which he at first hesitated to insert that species in his work was "vague;" and his statement that "the same kind was discovered, in the course of last summer, upon the coast of Scotland near Caithness," is not so satisfactory to me, as evidence that the exotic shell which he figured is British, as it appears to have been to him. In Loudon's Magazine for April 1836, Forbes adopted the name *nitida* for our shell, believing it to be Donovan's species; but two years afterwards, in his 'Malacologia Monensis,' he substituted for it *Alderi*. I am rejoiced at being thus able to cut the Gordian Knot by perpetuating a name endeared to all lovers of British marine zoology. Philippi at first called the present species *intermedia*; this he subsequently cancelled in favour of *marochiensis*, under an erroneous impression that the European species was *Nerita marochiensis* of Gmelin (founded on the *Neritæ Maroccanæ* of Chemnitz), said to inhabit Morocco, the West Indies, and Guiana. Philippi's mistake originated with Menke. Nor is our species *N. castanea* of Lamarck, as Bouchard-Chantereaux supposed, nor *N. pulchella* of Risso, to which Lovén has assigned it. According to the last-named author it is the *N. similis* of Koch. Leach named it *N. Lamarckiana*. *Nerita pellucida* and *N. alba* of Adams (Linn. Trans. iii. p. 67) were possibly the fry of this species. *Natica immaculata* of Totten is allied to the variety *lactea*, but has a much more open umbilicus.

6. N. MONTACU'TI*, (*Montagui*) Forbes.

N. Montagui, Forb. Mal. Mon. p. 32, pl. ii. f. 3, 4; F. & H. iii. p. 336 pl. ci. f. 3, 4, and (animal) pl. PP. f. 4.

BODY pale brownish-yellow, creamcolour, or whitish with a brownish or yellowish-brown tint above, whitish underneath: *snout* very broad, light-brown, and rounded in front: *tentacles* moderately long and pointed, white; they are sometimes carried nearly erect, or project sideways: *eyes*, none observable: *foot* capable of great dilatation, and, when fully extended, occupying twice the area of the shell; anterior portion divided above into two ear-shaped or triangular lobes, and edged with reddish- or purplish-brown; middle portion squarish in front, with a slight indentation in the middle and rather sharp corners; posterior portion oval, with a rounded tail.

SHELL globular, thick and solid, opaque, having very little gloss; *sculpture*, none except minute irregular lines of growth: *colour* fawn of various shades passing into buff or reddish-brown; there is often a whitish band round the top of each whorl: *epidermis* yellowish-brown, usually preserved within the umbilicus only: *spire* short, with a blunt point: *whorls* 5–6, tumid, enlarging more gradually than in *N. Alderi*; the last whorl occupies nine-tenths of the spire: *suture* nearly straight, wide and narrowly channelled: *mouth* equal in length to nearly four-fifths of the spire, not much expanded, and bluntly angulated at the base; throat reddish-brown: *outer lip* gently incurved on the periphery, having a rather thick edge: *inner lip* white, irregularly spread over the pillar, forming a small callosity or tooth-like process at the upper angle of the mouth, besides a slight pad in the middle, being the termination of the umbilical ridge, the lower part is very thick: *umbilicus* rather large and roundish, not much contracted by the inner lip; it has on that side a strong and wide ridge, winding into the interior of the spire, and separated from the base of the shell by a deep furrow, which notches the pillar: *operculum* horncolour, somewhat more solid than in other British species, microscopically and very closely striated in the line of growth; spire concave, defined by an overlapping and raised edge. L. 0·5. B. 0·475.

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* Named in memory of the author of 'Testacea Britannica.'

Var. 1. *albula.* Whitish.

Var. 2. *conica.* Spire more produced.

HABITAT: Not uncommon on a sandy or gravelly bottom mixed with mud, and among nullipore, in 15–90 f., throughout the Scotch, Irish, and north of England coasts; Isle of Man and Devon (Forbes); Plymouth (Jordan); Cornwall (Peach, M'Andrew, and Hockin); 110–140 f. off the Mull of Galloway (Beechey, *fide* Thompson); in the stomachs of gurnards at Cork (Humphreys). Both the varieties are Zetlandic. Clyde beds (J. Smith); Aberdeenshire (Jamieson); post-glacial deposits in Norway, 0–80 feet (Sars). Philippi's shell, of which he found a single specimen at Palermo, and doubtfully referred by him to the *Nerita helicina* of Brocchi, although it is not that species, may be ours, and fossil also. Its foreign range is entirely northern, from Iceland (Steenstrup and Torell) and Finmark (Sars) to the south of Sweden (Lovén and others); depths 3–70 f.

N. Montacuti sometimes swims in an inverted position; and it emits a thick slime from its foot. The jaws are small and thin; tongue thickly but not sharply spinous, with an unarmed and curled point at the inner extremity. This is the smallest of our native *Naticæ.* It is, besides, distinguishable from *N. Alderi* by its colour, more globular shape, shorter spire, tumid whorls (the last of which is not so disproportionately large, viewed with the mouth downwards), wider and channelled suture, and by the umbilicus being rounder and more open, and furnished with a broad ridge, which is defined on the lower side by a deep groove.

It is the *Nerita rufa* of Montagu; but Born's species of that name (which belongs to the present genus) is a large tropical shell. Macgillivray described our species as *Natica rutila*, and the young as *N. squalida*. I have ventured, for the sake of uniformity, to slightly alter the spelling of the specific name given by Forbes. Montagu's ancestor in Domesday Book was Drogo de Monte acuto, afterwards Montacute and Montagu; the Latinized form of the name is therefore *Montacutus*, and not *Montaguus*. Thus we have the well-known genus *Montacuta*.

One of the most common shells in our newer tertiary and quaternary formations is the *Nerita affinis* of Gmelin, alias *Natica clausa* of Broderip and Sowerby. I will mention only a few of the localities, to show the extent of oscillation to which the area of the British Isles and of the surrounding sea has been subjected within a comparatively recent period:—Mammalian and Red Crag, not much above the present level of the sea (S. Wood); Moel Tryfaen, 1330–1360 feet (Darbishire); dredged in 25 f. = 150 feet, off Larne, co. Antrim, and from a raised sea-beach near high-water mark, at Fort William (J. G. J.); Clyde district, at a considerable height (Watson and others); Shetland sea-bed, 80 f. = 480 feet (Barlee). It now inhabits the circumpolar and northern ocean in both hemispheres, its southern limit on this side of the Atlantic being Dröbak in Christiania-fiord (Sars), with a bathymetrical range from the shore to 150 f. It occurs in a fossil state throughout Scandinavia and Canada; and Dr. Van Geuns discovered it in a pliocene bed near Palermo. I need not particularize the synonyms of this species.

Another relic of the glacial epoch is *N. Smithii* of Brown, a specimen of which was found by the late Duchess of Argyll at Ardincaple near Helensburgh. This is the *N. flava* of Gould and *N. aperta* of Lovén, as well as probably *N. fragilis* of Leach and *N. glacialis* of Danielssen—an arctic species. Finmark, in 40–60 f., is its most southern known habitat.

The following species of *Natica* and allied genera have been wrongly introduced into the British fauna :—

1. *Nerita nitida,* Donovan = *Naticina lactea,* Guilding; West Indies.

2. *Nerita intricata,* Don. = *Natica Valenciennesii,* Payr. ; Mediterranean.

3. *Nerita tuberosissima,* Mont. ; West Indies.

4. *Nerita virginea,* Linn. ; West Indies. This is perhaps also the *Nerita glabrissima* (horresco referens !) of Brown = *Nerita sulcata* of Turton, not of Born = *Natica Browniana* of Leach.

Family XXI. SOLARI'IDÆ, Chenu.

Genus ADEOR'BIS*, Searles Wood. Pl. III. f. 5.

Animal unknown.

Shell small, trochiform with a flattened base, porcellanous, few-whorled, deeply umbilicate: *spire* depressed: *mouth* obliquely rhombic, angulated above and slightly notched or emarginate below: *operculum* horny, having an excentric or lateral spire.

The position of this family and genus is unsatisfactory; we want more information as to both. The animal of the typical genus, *Solarium,* is thus described by Reeve in his 'Elements of Conchology:'—"disk small, oval, elevated on a short pedicle, and furnished at its hinder extremity with a small horny operculum; head flattened, and prolonged into two tentacles, at the base of each of which is a short pedicle, supporting the eyes; the mantle is reflected into a collar around the aperture." And he remarks that it differs from *Turbo* and *Trochus* in the head not being snout-shaped, "but prolonged, somewhat after the manner of *Buccinum* and *Purpura*, into two elongated tentacles." The family is called *Architectonicidæ* by Messrs. Adams, and *Architectomidæ* by Dr. Gray; the former place it near *Eulimidæ*. Searles Wood was anticipated in giving a name to the present genus. In an "Enumeration of Marine Shells" found on the South Devon coast, published in 1829 (a copy of which was presented to me by Dr. Turton "from the author"), the genus *Tornus*, signifying a turner's wheel or lathe, was characterized as follows:—"Shell orbicular, depressed, aperture oval or roundish; pillar none. Operculum horny. Includes *Helix subcarinata*." This publication was anonymous, a circumstance which may deprive the author of the right of precedence according to the laws of scientific nomenclature. I therefore retain *Adeorbis*, although the other name is preferable. Perhaps this genus should merge in *Solarium*. Many species assigned to it by Mr. S. Wood and others must be removed from it, and placed in different genera.

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* Approaching a circle.

ADEORBIS SUBCARINA'TUS*, Montagu.

Helix subcarinata, Mont. Test. Br. p. 438, t. 7. f. 9. *A. subcarinata*, F. & H. ii. p. 541, pl. lxviii. f. 6–8.

SHELL nearly circular, solid, semitransparent when fresh, and having very little gloss: *sculpture*, strong and prominent, but narrow, spiral ridges, of which there are 6 on the body-whorl, 2 on the next, and none on the upper two whorls, which are quite smooth and polished; the ridges on the body-whorl are thus disposed,—1 close to the sutural line, 2 below it, 1 on the periphery, and 2 encircling the base; the interstices of all the ridges are crossed by numerous longitudinal striæ, which are sometimes curved or flexuous; there are also still more numerous microscopical lines that traverse the whole surface obliquely; the effect of all these markings is an exquisitely beautiful ornamentation: *colour* white, with sometimes a yellowish- or reddish-brown stain, apparently the remains of an epidermis: *spire* extremely short: *whorls* 3½-4, compressed, rapidly enlarging; the upper part of the body-whorl slopes towards the peripheral ridge, which forms a sort of keel; this whorl, viewed with the mouth downwards, occupies more than two-thirds of the spire: *suture* well defined, but not deep, in consequence of the upper part of each whorl shelving towards the next: *mouth* large, indented by the ridges: *outer lip* projecting far beyond the other lip, rounded and sharp-edged; upper angle or corner acute: *inner lip* reflected on the upper part of the base (where it joins the outer lip) and slightly over the umbilicus, thickened and angulated on the under side, below which it makes a straight course outwards, where it ends in a small notch; this is very conspicuous when the shell is held on one side, with the spire from the observer: *umbilicus* rather large, obliquely sloping inwards, defined by the lower basal ridge, and striated lengthwise, more strongly as the shell advances in age: *operculum* thin, obliquely striated in the line of growth; spire extremely small, comprising several minute and close-set turns, and not unlike that of the operculum of a *Natica*; the outer whorl is disproportionately large. L. 0·04. B. 0·1.

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* Somewhat keeled.

Habitat: Laminarian and coralline zones, Sandwich (Walker and J. G. J.); Dover (Lyons, *fide* Montagu); Dorset, Devon, Cornwall, and Bristol Channel (Montagu and others); Guernsey and Barmouth (J. G. J.); Irish coasts (Turton and others); Lamlash Bay, Bute (Norman); Aberdeenshire (Dawson). Red and Coralline Crag (S. Wood); Belgian tertiaries (Nyst, as *A. supranitida*); Dax (Basterot); Martillac (Grateloup);

Carubbare, near Rhegio (Philippi). It inhabits all the coasts of France (D'Orbigny père and others); Vigo Bay, 4 f. (M'Andrew); Corsica (Duminy, *fide* Requien); Algiers (Weinkauff); Mogador, 3 f. (M'Andrew); Sicily (Philippi); Adriatic (v. Schröckinger); Ægean (Forbes).

Although this pretty little shell is by no means rare—indeed it is very common at Guernsey—the animal has not yet been discovered. Through the kindness of Mr. M'Andrew, who dredged a living specimen at Mogador, I am fortunately able to describe the operculum. For an account of the false operculum, which has misled systematists as to the position of this genus, I would refer to page lv of the Introduction to the first volume of the present work.

It is the *Trochus rugosus* of Brown, *Delphinula trigonostoma* of Basterot, and *D. minuta* of D'Orbigny père.

Family XXII. VELUTI'NIDÆ, Gray.

Body semioval: *mantle* notched in front, or folded so as to form a short branchial canal: *snout* or mentum prominent: *proboscis* retractile, issuing from a vertical slit in the middle of the tentacular veil: *tentacles* widely apart, and separated by a veil-like membrane: *eyes* on bulbs or tubercles at the outer bases of the tentacles: *foot* oblong, double-edged in front: *gills* double, formed of unequal-sized plumes (Cuvier, Bouchard-Chantereaux, and others; "single," Clark): *odontophore* long, flat, and coiled; rhachis 1-toothed; pleuræ consisting of 3 claw-shaped and similar uncini, or of a single very large one. Sexes distinct.

Shell ear-shaped: *spire* lateral, small, and very short: *mouth* occupying nearly the entire base of the shell, and exposing the interior of the spire.

The use of the pallial notch or fold is to conduct water to the gills.

Genus I. LAMEL′LARIA[*], Montagu. Pl. III. f. 6.

Body depressed: *mantle* shield-like, completely enveloping and concealing the shell: *snout* small.

Shell internal, white, and very thin: *epidermis* filmy.

This resembles a *Doris* (one of the sea-slugs) in appearance; and no one who is unacquainted with the varied structure of the Mollusca would suspect that the soft body of the *Lamellaria* had an internal spiral shell to protect its vital organs. It usually inhabits the lowest margin of the littoral zone, but is sometimes found in very deep water,

> "Lying with simple shells."

The anatomy of the genus has been most carefully worked out by Dr. Bergh of Copenhagen.

Lamellaria, as a genus, was instituted by Montagu (Trans. Linn. Soc. xi. pt. 2. p. 184), and divided into two sections, the former being represented by *Pleurobranchus membranaceus,* and the latter by *L. perspicua.* The genus *Pleurobranchus* having been afterwards established by Cuvier, Menke in his 'Synopsis' restricted the present genus to the species comprised in Montagu's second section. It forms part of the genus *Sigaretus* of Cuvier, and is the *Coriocella* of De Blainville. Leach called it *Marsenia,* H. & A. Adams *Cryptocella*; Gray made out of it three genera, viz. *Ermea* for *L. perspicua, Lamellaria* (which he placed in another family with *Cypræa*) for *L. tentaculata*—these, by the bye, being different sexes of the same species,—and *Marsenina* for *L. prodita.* Both he and Troschel consider that *Lamellaria* (or *Marsenia*) and *Marsenina* belong to different families, their opinion being based on the differences of the lingual apparatus. According to Macdonald the genera *Brownia* of D'Orbigny, *Echinospira* of Krohn, and *Calcarella* of Souleyet, as well as his own genus *Jasonilla*, are the young of exotic species of *Lamellaria*. Lamarck's genus *Sigaretus* has an external and operculated shell, and belongs to the *Naticidæ*; it was founded on the Sigaret of Adanson, being the *Helix haliotoidea* of Linné. A great deal has been written on the historical part of this subject, with more or less correctness. I do not claim any merit for endeavouring to elucidate it; nor, while making the attempt, do I feel that I incur the satirical reproach of Persius:—

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[*] From the plate-like or scaly shape of the mantle.

> Scire tuum nihil est, nisi te scire hoc sciat alter;

which Gifford renders,

> "Is science only useful as 'tis shown,
> And is thy knowledge nothing if not known?"

LAMELLARIA PERSPI'CUA*, Linné.

Helix perspicua, Linn. S. N. p. 1250. *L. perspicua*, F. & H. iii. p. 355, pl. xcix. f. 8, 9, and (as *L. tentaculata*) f. 10; (animal) pl. PP. f. 1 and (as the last-named species) f. 2.

BODY varying greatly in colour, which is sometimes lemon with oval clear specks or else tessellated with milk-white, light-yellowish mottled with reddish spots and a few white flakes, orange or whitish with orange blotches interspersed with flake-white spots, or in other cases reddish-brown or umber speckled with a few irregular yellow dots, which are darker in the centre: *mantle* thickly studded with large and coarse roundish-oval warty tubercles or pustules of nearly the same size, each surrounded by a border of flake-white and having a small dark speck in the middle; underneath are two lobes which fold nearly halfway over the foot: *pallial sinus* narrow, deep, and short: *snout* semicircular and thick, cloven at the point, and projecting beyond the foot: *tentacles* awl-shaped, rather long, slender, and finely pointed, slightly scalloped at the edges, diverging at an angle of about 30°; they are never carried erect, but pressed downwards by the mantle: *eyes* black, placed on extremely short offsets; they are seldom visible from the outside, in consequence of their being covered by the edge of the mantle, but are exposed when the animal floats or swims: *foot* large and long, squarish in front with a short triangular lobe at each corner, bluntly pointed behind.

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* Transparent.

Shell resembling in shape a very small *Haliotis* without holes (although it is more raised or convex), of a somewhat membranous consistency, transparent when fresh, and of a more or less iridescent lustre: *sculpture*, minute, irregular, but distinct lines of growth, which are especially conspicuous just below the suture, and more numerous microscopical spiral striæ, that sometimes become confluent and form stronger lines: *colour* clear white, with occasionally either a darker or a paler zone on the upper part of the body-whorl: *spire* oblique, very small, placed near the end of the shell: *whorls* 2½–3, tumid, the last occupying eleven-twelfths of the spire (viewed with the mouth downwards); the first whorl is apparently semidetached from the next, and twisted: *suture* wide and deep: *mouth* expanding outwards, exceeding in length five-sixths, and in breadth seven-tenths of the shell; its base is entire: *outer lip* sloping from the periphery, with a curved outline, but somewhat contracted; edge thin: *inner lip* nearly semicircular, forming on the pillar a thin glaze, slightly striated lengthwise, and continuous with the upper edge of the outer lip. L. 0·65. B. 0·45.

Male. Body white, with a few flake-white spots on the head, yellowish with black spots, or plain dirty white: *verge* falciform. Shell much smaller and flatter, with the spire placed somewhat less obliquely, and having a proportionally larger mouth.

Var. *lata*. Shell smaller, broader, more compressed, but not flattened as in the last form, nor contracted in front.

Habitat: Adhering to the under surface of loose stones, and in rock-pools, at low-water mark of spring tides, in the laminarian zone, as well as in the coralline and deep-sea zones down to 87 f.; generally diffused throughout our seas. Both sexes are found together. I dredged the variety in deep water off Unst; it may be the *Bulla latens* (Ström) of Müller's 'Prodromus,' and *Sigaretus Stromii* of Sars. Fossil in the Coralline Crag at Sutton (S. Wood); Palermo (Philippi). Abroad this species ranges from Norway (Lovén and others) to Madeira and the Azores (M'Andrew), and throughout the Mediterranean, Adriatic, and Ægean (Linné, v. Schröckinger, Forbes, and others), the coasts of the United States (Gould and Stimpson), and Canada (D'Urban); shore to 69 f.

The mantle, tentacles, and foot assume different positions when the animal is quiescent and in active motion. It swims or floats with apparent ease. The gill-plume (whether single or double I could not make out) is of a yellowish-brown colour. Mr. Daniel found constantly in the stomach portions of branched corallines, probably indicating that the *Lamellaria* feeds on Polyzoa. According to Mr. Peach the female eats a round hole in a jelly-like compound Ascidian (*Leptoclinum punctatum*), for the purpose of making her nest and depositing in it her eggs. This nest is pot-shaped, and covered by a circular lid; it is at first bright yellow, which after some time fades and changes, becoming at last dirty white. As the embryo increases in size the nest rises up beyond the surface of the Ascidian, having been previously covered on all sides. The spawn is deposited from February to May; it arrives at maturity in four or five weeks. The embryo, when enclosed and swimming in the glairy matrix, is of a somewhat triangular shape; the front portion is trilobed, each lobe being furnished with delicate vibratile cilia which are in constant motion; the central portion is granular, and the hinder bluntly pointed. On the pot-lid bursting open, and the fry emerging, the latter is found to have a pellucid nautiliform shell, retaining in other respects the appearance of its fœtal state, and destitute of tentacles, eyes, or foot.

Mr. Peach's excellent observations were continued regularly for ten years. Every season the *Lamellaria*, as if impelled by the same instinct which takes the salmon to the river, and the herring to shallower water, migrated inshore and sought its proper spawning-ground. Mr. Hennedy had previously to Mr. Peach, ('Zoologist' for 1853, p. 4185) noticed this instinctive habit in *Lamellaria*. The only mistake Mr. Peach appears to have made—a very pardonable one—was in supposing that his specimens belonged to the species called *tentaculata* by Forbes and Hanley. They are undoubtedly the typical form, which I have ascertained to be the female. That the other form is the male is manifest from the descriptions of M. Bouchard and Dr. Johnston. The epidermis of the shell becomes blistery if soaked in water, like that of some exotic snails.

The types of both Montagu's species are in the British Museum, and represent the two sexual forms. The male is the *Marsenia complanata* of Leach, the female his *M. producta*. The latter is the *Bulla haliotoidea* of Montagu, and has half a dozen other less known-synonyms.

Genus II. VELUTI'NA*, Fleming. Pl. III. f. 7.

BODY compressed: *mantle* thick or puffy: *snout* large and gibbous.

SHELL external, yellowish-brown, not very thin: *epidermis* thick, velvety.

Indicated by Fabricius in 1780. It was founded on the *Bulla velutina* of O. F. Müller by Dr. Fleming, in his 'Philosophy of Zoology,' 1822; and M. de Blainville, apparently without any knowledge of Fleming's prior publication, proposed the same generic name for that species, in his 'Manuel de Malacologie et de Conchyliologie,' 1825. Brown called it *Galericulum*. There are but few species known of this genus or of *Lamellaria*.

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* Velvety; name (not classical) derived from the epidermis.

1. Velutina plica'tilis*, Müller.

Bulla plicatilis, Müll. Prod. Zool. Dan. p. 242. *V. flexilis*, F. & H. iii. p. 350, pl. xcix. f. 6, 7, and (animal) pl. OO. f. 6.

Body bright orange, sometimes speckled with yellow; back and tentacles of a paler hue: *mantle* tumid, partly reflected over the spire and hinder edges of the mouth of the shell: branchial opening large, on each side of the head: *snout* broad: *tentacles* cylindrical, rather long; tips blunt: *eyes* small and black, on swollen offsets; *foot* lanceolate, broad, and rounded in front with large ear-shaped corners, bluntly pointed behind: *gills* pale-red, forming a single plume.

Shell more oblong than oval, nearly membranous, semitransparent, having scarcely any lustre: *sculpture*, obscure spiral striæ and irregular lines of growth; the apex is microscopically and closely striated in a spiral direction: *colour* yellowish, becoming yellowish-brown or coppery in aged specimens; apex usually whitish: *epidermis* tough, but easily separated into slight fibrous plaits: *spire* obliquely twisted upwards: *whorls* 2½, ventricose in fresh, but compressed (from collapse) in dried specimens; the last occupies almost the whole of the shell: *suture* deep, and exposing a considerable part of the penultimate whorl: *mouth* oval, placed below the periphery, expanding outwards, and equalling in length four-fifths of the shell; base rounded: *outer lip* not much curved, reflected when the shell is dried—often so much so as to form a blunt and thickened edge: *inner lip* semicircular, dark orange, of a uniform width, thick, slightly reflected, and forming with the outer lip a complete peristome. L. 0·5. B. 0·35.

Habitat: Among *Tubularia indivisa* and other zoophytes, on stony or hard ground, in the coralline zone, Northumberland and Durham (Alder and others), Hebrides and west of Scotland (Forbes and others), Aberdeen (Macgillivray), Dunnet Bay, Caithness (Peach),

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* Flexible.

Orkneys (Goodsir and Forbes), Tresta Voe, Shetland (J. G. J.); no less rare than local. Scandinavia (Müller and others); Iceland (Steenstrup); Greenland (Mörch); Kamptschatka (Steller, *fide* Middendorff), and perhaps the Kurile Islands (Pallas).

Lives in company with *V. lævigata.* Both seem fond of floating, and of getting out of the water if confined in a vessel. The middle plate of the tongue in the present species is much deeper and proportionally narrower than in *V. lævigata;* and it has fewer notches, the central one of which does not extend half way down, instead of to the base as in the other species; and the first side-plate has no claw, nor are the second and third pleuræ so long or so much incurved.

It is perhaps the *Helix coriacea* of Pallas, and undoubtedly the *Bulla flexilis* of Montagu. Müller's description is not less full and precise than that of his *B. velutina,* the identity of which, as the type of this genus, has never been questioned. Gray raised the present shell to generic rank as *Velutella.*

2. V. LÆVIGA'TA*, Pennant.

Helix lævigatum ?, Penn. Br. Zool. iv. p. 140, pl. lxxxvi. f. 139. *V. lævigata*, F. & H. iii. p. 347, pl. xcix. f. 4, 5, and (animal) pl. OO. f. 7.

BODY milk-white, or whitish with a frosted appearance (caused by fine anastomosing lines), sometimes having a faint yellowish or pinkish hue: *mantle* pale yellow, often puckered (as if distended with water); border slightly reflected upon the shell or extending beyond its edges; pallial sinus narrow, leading to a small round hole, which constitutes the branchial opening: *snout* broad, thin, somewhat bilobed, and longer than the front edge of the foot: *tentacles* contractile and varying in length (usually short, and widely diverging); tips blunt: *eyes* small and black, placed on tubercles: *foot* broad and thick, truncated or gently curved in front, with ear-shaped corners.

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* Smooth.

deeply indented and narrowed on each side, and rounded or bluntly pointed behind when at rest; it occupies nearly all the aperture of the shell; when extended, the sole is shaped like a shoe: [*gills* arranged in two plumes, which are unequal in size (Clark):] *male organ* falciform, short and yellow, issuing on the right-hand side of the head.

SHELL triangularly oval, not so thin as the last species, semitransparent, lustreless except when the epidermis has been removed, or (as is sometimes the case) has failed to grow: *sculpture*, conspicuous and regular, but slight, spiral ridges, and numerous minute longitudinal striæ, which cross the ridges in the early stages of growth; there are also the usual lines of increase: *colour* whity-brown, tinged with fleshcolour or pink (especially in southern specimens): *epidermis* tough, yellowish-brown, folded on the ridges of the shell, and longitudinally fibrous: *spire* twisted upwards: *whorls* 3½, ventricose, the last occupying nearly the whole of the shell and expanding outwards: *suture* deeply channelled, so as to expose a considerable portion of the penultimate whorl: *mouth* roundish-oval, dilated, placed a little below the periphery, and equalling in length seven-eighths of the shell, slightly angular above and rounded below; inside white, pale orange, or fleshcolour: *outer lip* forming almost an arc of a circle; the edge, being thin and covered by the epidermis, shrinks when the shell is dried, and is usually broken or cracked: *inner lip* lying at a lower level than the other, flexuous, and mostly white, broadly reflected on the upper part of the pillar (where it joins the outer lip), having elsewhere a thick edge; behind it is a slight umbilical depression or chink. L. 0·8. B. 0·7.

Var. *candida*. White.

HABITAT: Everywhere beyond tide-marks, on hard ground. The variety occurred to me on the coasts of Antrim, the Hebrides, and Shetland. Fossil in the Clyde beds (Smith and others); Mammalian Crag at Thorpe (S. Wood); post-glacial deposits at Uddevalla (J. G. J.), and in Norway, 30–120 feet (Sars). Inhabiting the North Atlantic, from Greenland, Spitzbergen, Lapland, and Kamptschatka to Vigo (M'Andrew) and Spezzia (J. G. J.), with a range from low-water mark to 150 f.; United States (Gould and others); Canada (D'Urban); North Pacific (Stimpson and P. Carpenter).

"The animal discharges a very copious and tenacious clear white slime," Clark. According to Fabricius this secretion is frothy (like that of *Helix aspersa*), and serves the *Velutina* for concealment. Its locomotion is slow; and its sedentary habit may be presumed from Foraminifera being frequently attached to the shell. This presumption, however, is not quite tantamount to a fact, because (as Mr. Alder reminds me) Foraminifera and Polyzoa are found on the carapace and legs of some of the smaller crabs, which are anything but stationary animals. Greenland specimens of *V. lævigata* are very much larger and thicker than ours. Extremely young shells have a small umbilical cavity.

The *Helix lævigata* of Linné appears to be a lost species. It is described as of the size of a pea, transparent, very smooth, nearly oval, and glossy, with scarcely any umbilicus. He placed it next to *Limnæa auricularia*; no habitat is given. Pennant appears therefore to have considered the present species a freshwater kind. His description and figure almost suffice to identify our shell; but were it not so, it would be inexpedient to change the familiar specific name of *lævigata*. It is the *Bulla velutina*, Müller, *Helix haliotoïdes*, Fabricius (not of Müller, nor *H. haliotoïdea* of Linné), *V. capuloïdea*, De Blainville, *V. vulgaris*, Fleming, *V. striata*, Macgillivray, *V. rupicola*, Conrad, *Galericulum ovatum*, Brown, *V. Mülleri*, Deshayes, and *V. haliotoïdea*, Stimpson.

V. undata of J. Smith (*V. zonata*, Gould) is fossil in the Clyde beds, the Mammalian Crag at Bramerton, Uddevalla, and Canada; it inhabits the arctic seas of both continents. Another high-northern species, *V. lanigera* of Möller (*V. elongata,* Forbes and Goodsir), has been found by Mr. Searles Wood, according to Forbes, in the Mammalian Crag at Thorpe.

Family XXIII. CANCELLARIIDÆ, (*Cancellariadæ*) Forbes and Hanley.

Body regularly spiral: *mantle* having an incomplete or rudimentary branchial fold: *head* snout-shaped, and short: *proboscis* long, retractile: *tentacles* awl-shaped: *eyes* on stalks amalgamated with the tentacles at their outer base: *foot* lanceolate, comparatively small: *gills* double. Sexes separate.

Shell turbinated, more or less umbilicate: *spire* erect: *mouth* grooved within at the base, and having continuous lips: *pillar* plaited, or else furnished with a single fold or a tubercle: *operculum* horny, not spiral, but increasing by semielliptic oblique layers.

In Troschel's classification of the Gastropoda, founded on the structure of their lingual apparatus, the present family is arranged alongside of the *Velutinidæ, Sigaretidæ,* and *Naticidæ*; the same natural position is indicated by their shells. But it is questionable whether the odontophore affords constant characters to distinguish species; for, in the supplement to his excellent and elaborate treatise, the learned German Professor notices a difference as to the development of the notches in the teeth of certain specimens of *Trichotropis borealis.* The typical genus, *Cancellaria,* is not British, although abounding elsewhere in recent and fossil species of elegant shape and beautiful sculpture. It is said to have no operculum. So little, however, is known of the animal of that genus that I cannot compare it with the soft parts of *Trichotropis*; and I will therefore omit this part of the description, in treating of the latter genus.

Genus I. TOREL′LIA*, Lovén, MS. Pl. IV. f. 1.

Shell globose, covered with a velvety epidermis: *spire* very short; apex depressed: *mouth* roundish, furnished with a blunt tubercle on the pillar, at its base; groove internal, scarcely perceptible [: *operculum* horny (Lovén)].

One species only has been discovered; it is Zetlandic and Scandinavian, and appears to be very rare.

Torellia vesti′ta†, Jeffreys.

Recluzia aperta, Jeffr. in Ann. & Mag. N. H. 3rd ser. iii. p. 114, pl. iii. f. 22 *a–c*.

Shell intermediate in shape between that of a *Littorina* and a *Natica*, rather thin, semitransparent, and of a dull hue: *sculpture*, numerous fine spiral striæ, besides more close-set and minute longitudinal striæ, which are chiefly discernible on the base; these latter cross the spiral striæ and form short rows in their interstices: *colour* chalky-white: *epidermis* pale yellowish-brown, velvety, and marked like the surface of the shell: *spire* conical, with a blunt apex: *whorls* 5–6, tumid and rapidly enlarging; the last occupies three-fourths of the spire (viewed mouth downwards), and is considerably dilated: *suture* deeply and narrowly channelled: *mouth* nearly round, expanding and somewhat funnel-shaped; the basal groove is extremely short, and is not indicated by any notch in the outer margin: *outer lip* semicircular and sharp-edged: *inner lip* somewhat flexuous, broad, and folded back over the pillar, from which it is for the most part separate: *pillar* curved, having at its base a callous protuberance, below which is the short groove above mentioned: *umbilicus* rather small, narrow, and oblique, partly concealed by the reflexion of the inner lip. L. 0·6. B. 0·6.

Habitat: East coast of Shetland (Barlee); a single dead specimen. Although perfect, it is not in good condition. Professor Lovén showed me at Stockholm a specimen which he had dredged alive on the coast of

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* A well-merited compliment to Dr. Otto Torell, of Lund, the recent explorer of the Arctic Ocean at Spitzbergen.

† Clothed, *sc.* with a thick epidermis.

Norway: he said the animal has the produced lips and lingual dentition of *Capulus*, and that the operculum is like that of *Trichotropis*, and supported by a rounded lobe on each side.

When I first described this remarkable shell, I erroneously supposed it to belong to the genus *Recluzia* of M. Petit, and that it might be the *Natica aperta* of Lovén. I have therefore now withdrawn these generic and specific names, and substituted others in their stead.

Genus II. TRICHO'TROPIS*, Broderip and Sowerby.
Pl. IV. f. 2.

Shell conical, covered with a horny epidermis, which rises into bristly points on the ridges encircling the whorls: *spire* more or less elongated, with a pointed apex: *mouth* angularly oval, furnished with an oblique and blunt fold on the pillar, near its base; groove shallow, conspicuous, but not indicated outside by any notch: *operculum* pear-shaped, small, formed of curved laminæ in the line of growth, with a nearly terminal nucleus.

Trichotropis makes an approach to the canaliferous univalves or Siphonobranchiata. It inhabits stony ground in the coralline zone and sometimes in deeper water. "Lingual dentition similar to *Strombus*; *teeth* single, hamate, denticulated; *uncini* 3, 1 denticulate, 2 and 3 simple," Woodward. The species are mostly arctic and antarctic; one has been described and figured by M. Petit from the Mauritius.

Trichotropis borea'lis†, Broderip and Sowerby.

T. borealis, Brod. & Sow. in Zool. Journ. iv. p. 395. *T. borealis*, F. & H iii. p. 361, pl. ci. f. 5, 6, and (animal) pl. II. f. 1.

Body creamcolour, or milk-white, minutely and irregularly speckled with pale yellow: *mantle* thick; branchial fold extremely short, and widely open: *snout* short, deeply bilobed, placed between the tentacles so as to keep them far apart: *tentacles* rather long and tapering, with blunt tips, much thicker on the lower third portion: *eyes* small and black; stalks about one-third the length of the tentacles: *foot* thick and narrow, rounded and double-edged in front, with a small triangular lobe at each corner, angulated and wedge-shaped behind.

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* Having hairy keels.

† Northern.

SHELL turreted, somewhat spindle-shaped or pointed at each end, with the base much shorter than the apex; it is solid, opaque, and lustreless: *sculpture*, several spiral cord-like ridges or ribs, of which 3 or 4 on the body-whorl, and 2 on each of the upper whorls are the strongest and most prominent; between these are smaller ribs, viz. 3 between the suture and the uppermost of the principal ridges on the body-whorl, 1 between that and each of the next two or three ridges, and 4 or 5 between the lowest ridge and the basal peak; the whole surface is also covered with microscopic spiral lines; besides the spiral sculpture the shell is closely and obliquely traversed lengthwise by fine thread-like striæ, so that the crests of the ridges and smaller ribs are delicately beaded: *colour* whitish, sometimes tinged with reddish-brown: *epidermis* pale yellowish-brown, forming thorn-like points or bristles on the crests of the principal ridges; these bristles are sometimes double: *spire* considerably elongated and finely pointed: *whorls* 7, moderately convex, but having a sharply angulated appearance, owing to the prominence of some of the spiral ribs; the last occupies seven-twelfths of the spire (viewed mouth downwards), and is somewhat dilated; top whorl smooth and glossy, twisted upwards: *suture* deep, channelled between the lower two or three whorls but not between the upper ones: *mouth* inversely pear-shaped, somewhat expanding outwards, not much more than half the length of the spire; inside white, pale orange, or yellowish-brown; the basal groove is angular, but not indicated by any notch in the outer margin: *outer lip* rounded, incurved on the periphery, with thin and scalloped edges, and fringed by the epidermis; the inside, or throat of the mouth, is grooved beneath the spiral ridges: *inner lip* flexuous, broad, and reflected on the pillar, to which it is for the most part attached: *pillar* also flexuous, having near its base a blunt fold, which extends obliquely upwards along the spire; below this fold is the short siphonal canal: *umbilicus* small, narrow, and curved: *operculum* obliquely oval, with a pointed termination, yellowish-brown, composed of flexuous laminæ, and irregularly striated; nucleus small, seldom if ever retained, in consequence of the terminal portion being easily broken off. L. 0·6. B. 0·325.

Var. *acuminata.* Spire much longer and more tapering.

Habitat: Hard ground, in the coralline and deep-sea zones, on our northern coasts, from the Dogger bank to the extremity of the Shetland Isles; local, but not rare. It is tolerably plentiful in the west of Scotland. North Channel, Irish Sea (Hyndman and J.G.J.); Lough Strangford (Dickie); co. Galway (Barlee). The variety is Zetlandic. Fossil on Moel Tryfaen, 1330–1360 feet (Darbishire); Clyde beds (Crosskey); "Ireland, Bute, Richmond" (Smith); Cruden, Aberdeenshire, "from Crag beds" (Jamieson); Mammalian Crag at Bridlington, and Coralline Crag (Wood); post-glacial deposits in Norway, 0–80 feet (Sars); Uddevalla (J.G.J.); Canada (Dawson). Living in the Arctic Ocean of both hemispheres, Sitka Island, Iceland, Faroe Isles, Norway, United States, and Canada; depths recorded 5–150 f.

In crawling it swaggers from side to side. The verge is falciform, above the right-hand tentacle. Stimpson says that the shell is frequently found in the stomachs of haddocks in Casco Bay. Nothing can exceed the beauty of the sculpture with which the shell is decorated; it is a piece of really dainty work. My largest specimen measures seven lines in length, and belongs to the variety. Sometimes either the spire or the mouth is twisted on one side. North American specimens are larger, thinner, and have more tumid whorls.

The discoverer of this shell was Capt. Laskey, who figured it in the 1st volume of the 'Memoirs of the Wernerian Society;' he considered it the young of Pennant's *Murex carinatus.* For the same reason which I gave for changing the specific name of *Torellia,* *borealis* must replace *carinata* in the present case; and it has, besides, the advantage of being in general use. It is the *Fusus umbilicatus* of Smith, *F. Laskeyi* of Macgillivray, *Trichotropis costellatus* of Couthouy, *T. acuminata* of myself, *T. atlantica* (Beck) of Möller, and *T. cancellata* of Hinds.

T. insignis of Middendorff occurs in the post-glacial deposit at Bridlington, and was noticed by Searles Wood as a variety of *T. borealis.* It inhabits Behring's Straits.

Admete or *Cancellaria viridula* (*Tritonium viridulum* of Fabricius) is also extinct in these seas, its shell being not uncommon in the Bridlington bed, as well as in the Red and Coralline Crag at Sutton. It survives in more northern latitudes, and on the east coast of North America. J. Sowerby described and figured this shell as *Murex costellifer*; it is the *Admete crispa* of Möller, and has other names as a species of *Cancellaria.* Troschel regards *A. viridula* as distinct from *A. crispa,* and the genus *Admete* as the type of a family distinct from that of *Cancellaria.*

Family XXIV. APORRHA'ÏDÆ, Troschel.

BODY spiral: *mantle* large and loose, forming a very short branchial fold at the partially channelled base of the shell, which it lines: *snout* cylindrical, contractile, notched in front: *tentacles* awl-shaped, separate: *eyes* on bulgings or short stalks, at the outer base of the tentacles: *foot* small, lanceolate: *gills* arranged in a single narrow plume: *odontophore* enveloped in a sheath, straight; rhachis single; pleuræ or uncini 3, plain-edged.

SHELL, when young, spindle-shaped, never umbilicate: *spire* turreted and tapering: *mouth* widely expanding: *operculum* small, horny, pear-shaped, increasing by semielliptical layers; nucleus nearly terminal, at the base of the mouth.

Included, with *Strombus,* in "Les Ailées" of Lamarck.

Genus APORRHA'ÏS*, Da Costa. Pl. IV. f. 3.

Shell sculptured with nodulous ribs and fine spiral striæ: *spire* ending in a blunt button-shaped point: *whorls* numerous: *mouth* angulated: *outer lip* usually dilated into several digitations or wing-like processes, each of which is narrowly and slightly grooved and terminates in an angular point or spike: *base* forming a shallow and beak-like rudimentary canal.

A shell-fish so peculiar and common in the Archipelago as *A. pes-pelecani* must have been known to "the father of natural history." He mentions it as one of the univalves possessing an operculum (*ἐπικάλυμμα* or *πῶμα*) which makes such shells bivalve. The muzzle seems to be of an intermediate kind between the snout-like head of *Trichotropis* and the true proboscis of *Purpura.* The difference of shape in the immature shell was pointed out by Lamarck; and its resemblance to that of *Cerithium* was urged by Swainson as a reason for merging the last-named genus in the *Strombidæ.*

Aporrhais of Aldrovandi and *Aporrais* of Gualtieri is the *Pterocera* of Lamarck. Petiver was the first to use the present name in its restricted sense; and the genus was sufficiently defined by Da Costa. The *Aporrhais* of Klein was one of the *Voluta* family. Klein's genera ought not to be recognized; they are ill-compounded, and much too extensive. In some cases each of his species comprises several modern genera. On the other hand, he calls *Murex* a class, and divides it into two genera, viz. *Murex frondosus* and *Murex costosus*. The present genus is his *Pes anserinus*. Philippi more correctly, but unnecessarily, renamed it *Chenopus*.

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* Probably the *ἀποῤῥαῒς* of Aristotle, so named from the split or ragged shape of the outer lip.

1. Aporrhaïs pes-peleca'ni*, Linné.

Strombus pes pelecani, Linn. S. N. p. 1207. *A. pes-pelecani*, F. & H. iii. p. 188, pl. lxxxix. f. 4, and (animal) pl. II. f. 3.

Body creamcolour, mottled in front with purplish-brown, or light purplish-brown, with white flakes and specks: *snout* extending far beyond the foot, often pinkish, minutely speckled with yellow or white dots; edges sometimes yellow; extremity cloven perpendicularly: *tentacles* diverging, fleshcolour, with a scarlet or white line down the middle, speckled like the snout; tips blunt, sometimes dark brown: *eyes* small, black, placed on prominent bulbs: *foot* extensile, narrow, white (occasionally spotted with pink), attached to the rest of the body by a broad and thick neck or stalk, square in front and rounded behind: *verge* long, strap-shaped, recurved, and yellow: *odontophore* short [; rhachis broad and convex above, narrower below, the front or cutting edge having a central spire and notched on each side; uncini, 1st nearly transverse, with its upper margin folded, 2nd and 3rd claw-like, slender, elongated, and intercrossing with those on the opposite side. (Lovén)].

Shell having an irregularly triangular or shoulder-of-mutton shape, with a jagged outline, solid, opaque, somewhat glossy: *sculpture*, short longitudinal ribs, which are thick and nodose or tubercular on the lower whorls, thin and curved on the upper whorls, becoming more numerous and very fine towards the point of the spire; there are 3 rows of nodules on the body-whorl, those of the uppermost row being the largest, those of the middle row next in size, and those of the lowest row small, bead-like, and more or less confluent; the rows are continued and project in the form of ridges on the pterygoid or wing-like processes of the outer lip (all of which are similarly strengthened), like the joints of a bat's wing; each of the next two or three whorls has only 2 rows, viz. one of large nodules in the middle, the other (which is frequently indistinct) of small beads close to the suture; the entire surface of the shell is covered with delicate and close-set impressed spiral lines or striæ: *colour* pale yellowish-white, sometimes tinged with fleshcolour or reddish-brown: *spire* elongated; apex compressed: *whorls* 12, convex, all but the last of those near the apex angulated in the middle; the body-whorl is twisted upwards, and occupies more than five-eighths of the spire; the first two or three whorls are tumid, quite smooth, and glossy: *suture* distinct, deeper between the upper than between the lower whorls: *mouth* narrow, shaped like a lance-head with the point downwards: *outer lip* large, white, microscopically granulated inside; it is expanded into a broad flap in front, a triangular and incurved process at the base, and another triangular process at the upper corner of the mouth; the flap has 3 angular processes, the uppermost being larger than either of the other two, which approximate; each of these different processes (5 in number) is grooved in the middle, but the smallest process (which is situate next to the base, and is sometimes rudimentary) less distinctly; the process above the outer lip diverges from the spire, and seldom extends higher than within six whorls from the apex: *inner lip* spread like a white enamel over the under side of the last and penultimate whorls, as well as over the basal process or beak, behind which it is folded so as to make a slight cavity: *operculum* closely laminated, with an obscure and irregular nucleus, faintly striated lengthwise. L. 1·85. B. (to the extreme point of the outer lip) 1·25.

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* Pelican's foot.

Var. *albida*. Whitish.

HABITAT: Coralline zone (occasionally the deep-sea zone also) on all our coasts. The variety was found by Mr. Waller in Dublin Bay, and by myself in Shetland. This common shell has been recorded from the upper Miocene, Pliocene, and almost every newer tertiary and quaternary deposit in Europe, from the sea-level to 1360 feet above it. North Atlantic from Finmark and Iceland to Gibraltar, the Mediterranean, Adriatic, and Ægean, at various depths between 5 and 100 f.

It is shy, slow, and awkward in its movements, twisting about its long neck and foot in order to gain a creeping posture. Among other fanciful names given to this odd-looking shell are "blobber-lipt Edinburgh whilk" of Petiver, "aile de chauve-souris femelle" or "patte d'oye" of D'Avila, and "zamarugola" of the Venetians, by the poorer class of which people the animal was—perhaps is still—eaten. According to Mr. Couch, *Solaster papposus* also reckons it an agreeable kind of food: when the soft portion has been digested, the empty shell is rejected, and becomes the habitation of a *Sipunculus*, which narrows the too capacious entrance with agglutinated sand. Specimens from deep water are smaller than those from the coast. The top of old but living shells which had lost their upper story is sometimes closed by a semispiral plug or septum of new shelly matter; the apex is very seldom perfect in full-grown specimens. When the outer lip is complete the subsequent growth takes place by adding fresh layers inside; so that the age of the individual is probably shown by the number of such layers. In immature specimens the commencement of the pterygoid or wing-like flap of the outer lip is defined by a rib of enamel along the mouth, which likewise lines the canal at the base as well as the upper process of the flap. Still younger specimens, before any sign of the flap appears, have the outer lip flexuous, with a wide and deep sinus at the upper part, and a long straight canal at the base. In this stage of growth they strongly resemble *Fusi*. The fry form a short cylinder. Monstrosities are not uncommon, especially in the shape and relative size of the digitated processes; the basal point, however, is always formed like a spear-head.

Da Costa altered the specific name to *quadrifidus*.

2. A. MACAN'DREÆ*, Jeffreys.

A. pes-carbonis, F. & H. iii. p. 186, pl. lxxxix. f. 5, 6.

BODY whitish, with a triangular patch of light pink on the neck: *snout* not extending as far as the foot, tinged on the upper side with pink, and divided down the front by a flake-white line or streak: *tentacles* sometimes curved like the horns of an ox, one on each side of the snout, speckled towards the tips with flake-white, and marked on the upper side by a white line down the middle; tips blunt, and yellow: *eyes* prominent, on short tubercles or stalks: *foot* narrow, in front obtusely rounded or nearly truncated, with a short angular corner at each side, behind pointed.

SHELL much smaller and of a more delicate shape and finer texture than the last species; when young it is thin, transparent, and glossy: *sculpture* nearly similar; but the ribs on the last two whorls are less knotty; the riblets on the upper whorls are more numerous; the spiral striæ are stronger and fewer on the lower part of the body-whorl and on the back of the outer lip, and are sometimes alternately large and small: *colour* whitish, sometimes having a pale fawn tinge: *spire* rather short; it does not taper as in the other species, nor is the apex so liable to be broken off: *whorls* 7–8, convex, but not angulated: *suture* less distinct between the lower whorls, owing to the above want of angularity: *mouth* proportionally shorter and wider: *outer lip* relatively larger, more palmated and flatter, divided into 4 processes, besides the basal point; all these form spikes, and far exceed in length the digitated processes of *A. pes-pelecani*; in the present species the uppermost spike frequently extends beyond the spire in a parallel direction, and is bent backwards; the lowermost spike has about the same length, and is also finely pointed, being slightly curved outwards; the three spikes which belong to the pterygoid flap or expansion project considerably, and are separate; the smaller two resemble the fork made by divided fingers; all the spikes are similarly grooved; the inside of the outer lip is microscopically pustulated: *inner lip* thin, spread over the lower side of the last three whorls; basal fold long and narrow: *operculum* slighter than that of *A. pes-pelecani*, but agreeing with it in other respects. L. 1·2. B. (to the furthest spike of the pterygoid flap) 1.

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* Named in honour of the discoverer, Mr. Robert M'Andrew, who has done so much to increase our knowledge of the Mollusca of the European seas.

Habitat: Muddy sand in 40–85 f. on the east coast of Shetland, at a distance from land of 6–50 miles (M'Andrew, Barlee, and J. G. J.); it is gregarious, although very local. M'Andrew and Barrett dredged a single dead specimen off the coast of Upper Norway, at a depth of 70 f.; but no Scandinavian zoologist appears to have met with it.

This mollusk is not so inactive as its associate, *A. pes-pelecani*. Its fæces are oval and brownish. Monstrosities of the shell sometimes occur: one has the top spike double or forked, another has four digitated processes on the outer lip, and in a third the top spike is attached to the lower five whorls. Some specimens are much smaller than others; I have given the average dimensions.

A. pes-carbonis of Brongniart (a fossil of the upper Miocene formation of Bordeaux and Antwerp) is equally small, but a much stronger shell; and the basal process is short, spear-head-shaped and incurved, as in *A. pes-pelecani*. The present species differs from *A. Serresiana* (a Mediterranean shell) in its smaller size, delicate texture, fewer and rounded (instead of angulated) whorls, and in the spire being much less tapering. Size alone is, of course, not an infallible criterion of distinctness—especially if we take into account the depth of water and distance from land; but it is remarkable that Zetlandic specimens of *Pecten aratus* (*P. Bruei*), *P. Testæ, P. septemradiatus*, var. *Dumasii, Tellina balaustina,* and many other species are larger than those from the south of Europe. If Philippi had not described his *Chenopus desciscens* (a Palermitan and Calabrian fossil) as having four keels or rows of tubercles on the last whorl, I should have been inclined to consider our shell identical with it.

Family XXV. CERITHI'IDÆ, (*Cerithiadæ*) Fleming.

Body spiral, elongated: *mantle* fringed at its outer edges, and forming in front a very short semitubular fold, which is not protruded beyond the notch in the shell: *head* snout-like and contractile; there is no proboscis: *tentacles* awl-shaped, separate at the base, and connected by a sinuous veil or membrane: *eyes* placed on bulgings outside the base of the tentacles: *foot* lanceolate: *gill-plume* single, composed of triangular plates: *jaws* or cheek-plates triangular: *odontophore* very short and straight, spinous; teeth 3 . 1 . 3. Sexes distinct.

Shell pyramidal, nearly always tuberculated, sometimes furnished with varices or persistent edges of the mouth, never umbilicate: *spire* tapering to a fine point: *whorls* numerous: *suture* slight: *mouth* small; groove at the base short and recurved: *operculum* horny, nearly circular, and spiral, with few whorls; nucleus not quite central, but on the inner side of the mouth.

An extremely prolific and widely diffused family, having perhaps few genera, although these abound in species both recent and fossil. The latter are almost countless. Deshayes, a long time ago, enumerated between 400 and 500 fossil species of *Cerithium*; and they have since multiplied beyond all reasonable bounds. Quousque? Their sculpture is very elegant and diversified; Lamarck recommended it to architects as a pattern for the ornamentation of columns. With respect to the animal, I would advise conchologists to study the careful observations of my friend Mr. Berkeley, on the anatomy of *C. telescopium*, in the 5th volume of the 'Zoological Journal.'

This family has some relations to *Turritellidæ* and *Scalariidæ*; but, in the present state of our knowledge, it is impossible to make a complete system of arrangement for the Mollusca, or one which will fit every group into its proper place.

Genus CERI′THIUM[*], Adanson. Pl. IV. f. 4.

Body slender: *head* broad and short: [*mentum* distinct, nearly free in front, actively vibrating: (Lovén)] *foot* notched or bilobed in front: *opercular lobe* simple.

Shell as described in the account of the family.

The difference between a true canal, indicated by an outside notch, and a mere groove inside the base of the shell was not unobserved by Linné, who says of his *Trochus perversus* (*C. perversum*), "columella basi prominula, at non in canalem evidentem." Deshayes separated this and other sinistrorsal species as a distinct genus (*Triforis*), because the mouth is apparently divided into three orifices. Their structure, however, is essentially the same as that of the smaller dextrorsal species, which Leach called *Bittium*. Colonna first applied the name *Cerithium* to this kind of shell; Prévost spelt it (perhaps more corectly) *Ceritium*. There is no end of synonyms; and if I were to give all in every genus and species which I describe, this work would be unnecessarily swollen to twice its present size.

1. Cerithium me′tula[†], Lovén.

C. metula, Lov. Ind. Moll. Scand. p. 23; F. & H. iii. p. 198, pl. xci. f. 3, 4.

Body thick and muscular, milk-white: *pallial fold* distinct:

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[*] Probably from κεράτιον, a small horn; hence κερατίνη, buccina.

[†] An obelisk.

head rounded, never much protruded: *tentacles* slender, but short, separated by an intermediate membrane, widely diverging outwards and usually curved, apparently annulated, owing to their contractility; edges flattened, and scalloped or slightly serrated; tips blunt and rounded: *eyes* black, very small, seated on bulbs outside the thickened and broad bases of the tentacles: *foot* long, narrow, and angular, truncated and double-edged in front, with ear-shaped or triangular corners, pointed behind.

SHELL shaped like a miniature obelisk, solid, opaque, glossy and somewhat prismatic; base slightly concave: *sculpture*, thread-like spiral ridges, of which 4 or 5 are on the last whorl, and three on each of the preceding whorls except the first two; there are also some slight and microscopic intermediate striæ and lines of growth; the ridges are crossed by numerous curved and fine ribs, producing nodules or small tubercles at the points of intersection; the spaces between the ribs are depressed; the base is usually devoid of all the principal markings; the first whorl and a half are smooth, and the next in succession has one ridge only, besides close-set longitudinal ribs: *colour* pale yellowish-white: *spire* greatly elongated; apex bulbous and twisted obliquely, slightly exceeding in breadth the first regular whorl: *whorls* 18–20, compressed, gradually increasing; the last occupies a quarter of the shell: *suture* slight, defined merely by the peripheral ridge: *mouth* bluntly rhombic, with a deep and rather wide groove at the base, which bends abruptly to the left, but does not form a complete canal; the entire length of the mouth scarcely exceeds one-sixth of the spire: *outer lip* curved, thin, and indented by the spiral ridges: *inner lip* forming a thickish glaze on the pillar, which is short and flexuous: *operculum* thin, pale-yellowish, rather coarsely striated in the line of growth; spire indistinct, with a minute nucleus. L. 0·8. B. 0·2.

HABITAT: Gravelly sand with mud, on the Shetland fishing-banks, in 45–96 f. (M'Andrew, Forbes, Barlee, and J. G. J.); rare. Post-glacial formation in Norway, 0–36 feet (Sars). Norwegian coasts, from Bergen to Öxfjord, in 20–150 f. (v. Duben, Sars, Lovén, M'Andrew and Barrett, Danielssen, Asbjörnsen, and Lilljeborg); Villa franca (Hanley); United States (C. B. Adams, as *C. Emersonii*, according to Danielssen).

It is sluggish, but not shy; the tentacles are sometimes folded back against the front of the shell, as in *Natica*. Professor Sars dredged an abnormal specimen in Mangerfiord, which had only two ridges on each whorl, in that respect analogous to the monstrosity *Clarkii* of *Cerithiopsis tubercularis*; he named his shell *Cerithium bicinctum*, with a doubt as to its being specifically distinct.

Described and figured by M'Andrew and Forbes as *C. nitidum*.

2. C. RETICULA'TUM*, Da Costa.

Strombiformis reticulatus, Da Costa, Br. Conch. p. 117, pl. viii. f. 13. *C. reticulatum*, F. & H. iii. p. 192, pl. xci. f. 1, 2, and (animal) pl. II. f. 2.

BODY yellowish-white or whitish, mottled and streaked with purplish-brown or faintly tinged with pink [ashcolour, speckled with brown (Philippi)]; the tentacles and foot are of a paler colour, the former spotted with purplish-brown, and the latter with flake-white: *mantle* not furnished with any filament or process: *pallial fold* wide, open, and scalloped at its edges, lining the notch at the base of the shell: *head* nearly cylindrical, long, strongly and closely wrinkled across (unless when fully extended), or marked with dark bars: *mouth* vertically cloven and bilobed when the animal is crawling, but expansile and forming a circular disk when it is feeding or at rest; underneath is a pink stripe on each side: *tentacles* slender, although not pointed, somewhat compressed above and below, slightly serrated or jagged at their edges; a double line of pink frequently runs down each tentacle in a siphonal form: *eyes* rather large in proportion, placed on short pale-coloured offsets or bulbs: *foot* long, squarish or gently curved and double-edged in front, with slight angular corners, attenuated towards the tail, which is sometimes rounded and rather broad, at other times bluntly pointed; sole finely grooved down the middle: *opercular lobe* expanded on each side, and extending beyond the operculum at the hinder end of the foot; I could not detect any such cirral process as is presented by *Rissoa*, notwithstanding the statement of Lovén, "An. *Rissoæ* lobo operculigero utrinque subalato, cirro postico rotundato-lanceolato."

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* Reticulated.

SHELL forming an extremely elongated pyramid with a narrow base, rather solid, opaque, having scarcely any gloss: *sculpture,* thread-like spiral ridges, of which from 8 to 10 are on the last whorl (4 above the periphery, and the rest below it), 4 on each of the preceding 7 or 8 whorls, 3 on each of the next two whorls, 1 or 2 on each of the upper two whorls, where they cease; the ridges are crossed by strong longitudinal ribs, which make the former nodulous; of these ribs there are about 20 on the penultimate whorl; they do not extend to the outer lip nor below the periphery; besides the above sculpture, close-set longitudinal striæ are perceptible with a magnifying power, and some of the ribs (but never more than one on a whorl) are varicose or unnaturally distended; the first whorl and a half are smooth and glossy: *colour* chestnut or reddish-brown of various shades, often dusky; the nodules sometimes whitish from friction: *spire* drawn out to a considerable length; apex bulbous, and twisted obliquely: *whorls* 15–16, rather convex; rate of increase very gradual, the last whorl equalling nearly one-third of the shell: *suture* deep, defined by the peripheral ridge: *mouth* triangular; basal groove rather wide, but not deep, turning abruptly to the left, not exhibiting any notch on the outside; the entire length of the mouth does not much exceed one-fifth of the spire: *outer lip* rounded, and slightly reflected; inside indented by the spiral ridges: *inner lip* forming a fine glaze, which is thicker on the pillar; the latter is very short and flexuous: *operculum* stouter than in the last species, obliquely and coarsely striated; its spire is composed of about half a dozen whorls, which are defined by an imbricated or overlapping edge. L. 0·5. B. 0·125.

Var. 1. *simplex.* Shell rather thinner, and glossy, without any varix; colour yellowish-white, the ridges marked by purplish-brown lines.

Var. 2. *lactescens.* Becoming milk-white.

HABITAT: Very common in the littoral and laminarian zones, on the southern and western coasts of England, Wales, and Scotland, as well as all round Ireland; Sandwich (Montagu). Var. 1. Sark (Barlee); Guernsey and Herm, living under stones and in rock-pools at low-water mark, and dead in 20 f. (J. G. J.): this is more frequent than the typical kind in the south of Europe.

Var. 2. Land's End (Hockin). *C. reticulatum* is fossil in the brick-earth of the Nar, west Norfolk (Rose); Lochgilphead (Geikie); post-glacial beds in Norway, 20–200 feet (Sars); Uddevalla (J. G. J.); tertiaries of the south of France and Italy (Potiez and Michaud, Brocchi, Scacchi, and Philippi). Its present distribution in a living state extends from the Loffoden Isles (Sars) to the Canaries (M'Andrew), and throughout the Mediterranean, Adriatic, and Ægean; recorded range of depth, shore to 140 f.

It crawls actively and quickly by means of its long foot, and occasionally suspends itself by a byssal filament to a bit of floating seaweed or to the side of the vessel in which it is kept. It seems to be not very particular in its diet, feeding on all sorts of animal and vegetable matters, especially such as are putrid or decaying; "we observed it sucking in ropes of molluscan mucus with great gusto and avidity." Clark. The shell varies extremely in size; it is usually sombre-looking, and may be called sad; but

> "Oh, idle thought!
> In nature there is nothing melancholy."

Monstrosities have been noticed by Mr. Thompson of Belfast and Mr. Cocks. In some specimens the spiral ridges, in others the longitudinal ribs are the stronger or more conspicuous. The spire, being long, is apt to be twisted on one side.

"The small needle whelke" of Borlase, *Murex acuminatus* of Pennant, *M. scaber* of Olivi, *C. Latreillii* of Payraudeau, *C. Danicum* of Beck (according to Örsted), and *Rissoa vulgatissima* of Clark. The *Trochus punctatus* of Linné might be this species, but for the description "anfractibus serie triplici punctorum;" our shell has never less than four rows. Bruguière gives Guadaloupe as the habitat of his *C. lima,* a name which many subsequent writers have adopted for the European species, which may be his *C. ferrugineum.* *C. afrum* of Danilo and Sandri appears to be nothing more than a small and dark-coloured sort of this most variable shell. I have the same from the Adriatic; Brusina erroneously referred it to the genus *Cerithiopsis.* Forbes and Hanley say that "the specific name *scabrum* was undoubtedly prior to that of *reticulatum.*" My copies of Da Costa's and Olivi's publications show, however, that *reticulatum* is fourteen years older than *scabrum.*

3. C. PERVER'SUM*, Linné.

Trochus perversus, Linn. S. N. p. 1231. *C. adversum,* F. & H. p. 195, pl. xci. f. 5, 6.

BODY slender: *head* broad, short; proboscis capable of being concealed? (recondenda?): *mentum* distinct, in front somewhat detached, and actively vibrating: *tentacles* long, cylindrical, slender, somewhat club-shaped at the top, separated at the base, connected by a flexuous veil: *eyes* on very short stalks or processes, at the base of the tentacles: *opercular lobe* simple. (Lovén.)

SHELL sinistrorsal, forming a more or less elongated pyramid, with a narrow and somewhat contracted base, solid, opaque, rather glossy: *sculpture,* rows or bands of small and close-set tubercles (about 25 in the lowest row), produced by the mutual decussation of spiral and longitudinal ribs; of these rows there are usually 3, sometimes 4, on the body-whorl above the periphery; the tubercles on that whorl are generally oblong with the greater axis in the direction of the spire, the others being granular or bead-like; each of the next 5 or 6 whorls has 3 rows, the next 5 or 6 whorls have 2 rows each, the following 3 or 4 whorls are not tuberculated, but exhibit very minute and numerous longitudinal striæ, which are encircled in the middle by a delicate spiral thread, in such a manner as to make the primary whorls appear keeled or angulated; the nucleus or top whorl is smooth and glossy; the middle row (when there are 3) is frequently smaller than either of the other two, and high up on the spire this is always the case, preparatory to the middle row being squeezed out or disappearing; the base of the shell is girded by 3 strong spiral ridges, two just below the periphery, and the third very short and winding obliquely round the semitubular and recurved groove or fluting at the extreme base; the uppermost of the basal ridges is occasionally beaded: *colour* dark chestnut, fading into yellowish-brown; tubercles mostly of a lighter hue: *spire* tapering to a fine point; apex as in the last species, but reversed: *whorls* 15–16, compressed, gradually enlarging; the last nearly equals one-third of the shell: *suture* narrowly excavated: *mouth* squarish; groove narrow and deep, turning abruptly to the right; it is nearly closed above, in consequence of the inner lip overlapping one side of the groove and of the outer lip being contracted into a small but deep sinus on the other side; the relative length of the mouth is the same as in the last species: *outer lip* semicircular and prominent, slightly reflected in the middle, having the upper and lower corners contracted into a small and deep sinus or indentation, and considerably retreating on the upper side where it joins the periphery; edge scalloped by the spiral ridges; inside smooth: *inner lip* broad, forming a thick pad or deposit on the pillar, with which it makes an obtuse angle; this lip is united with the other at the upper corner of the mouth: *pillar* short, strong, and curved: *operculum* rather thin, obliquely and irregularly striated; spire small, indistinct, with a circular and many-whorled nucleus. L. 0·35. B. 0·1.

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* Turned the wrong way.

Var. *pallescens.* Whitish, faintly tinged with yellowish-brown.

HABITAT: Southern and western coasts of England and Wales, the Channel Isles, and all Ireland; Sandwich (Walker and J. G. J.); Clyde district (Smith and Norman); Dunbar (Laskey); Aberdeenshire (Dawson); Caithness (Gordon); Orkneys (Forbes and M'Andrew); Shetland (F. & H.). Not uncommon in the lower part of the littoral zone, and down to the coralline. I dredged the variety at Guernsey. Italian tertiaries (Brocchi and Philippi); Irish beds (Smith); Coralline Crag (S. Wood); post-glacial formation in Norway, 120 feet (Sars). The present distribution of the larger or typical form ranges from Brittany (Cailliaud) to Madeira and the Canary Isles (M'Andrew), and throughout the Mediterranean, Adriatic, and Ægean (shore to 69 f.); that of the smaller, which is our form, is more extensive (shore to 100 f.), and comprises also the Scandinavian coast from Christiansund (Danielssen) and Bohuslän (Lovén and Malm) to Hællebæk in Zealand (mus. Copenh.). West coast of North America (Cooper, *fide* P. Carpenter).

The shell is never varicose. Linné noticed that in this species also there is no canal as there is in *Buccinum.*

I can see no other difference than that of size between Mediterranean and British specimens, said to belong to two species, viz. *C. perversum* and *C. adversum*. They agree in shape, sculpture, colour, form of the mouth, and all other particulars. The greater size of the former shows a deviation from the general rule; the same exception appears in *C. reticulatum* also. It must be observed, however, that size is an extremely variable character in the genus *Cerithium* and its allies. I have specimens of *C. reticulatum* and of the present species from the south of Europe smaller than any from the north. The only distinction pointed out by the authors of the 'British Mollusca' between *C. perversum* and *C. adversum* is that the latter is "far scarcer and less diffused." Besides the name (*Murex adversus*) given by Montagu, this shell has 11 others, which my readers will not thank me for specifying. It is almost time that the tedious and useless practice of repeating obsolete synonyms should cease.

The "large, subpellucid, white variety" of the last species, noticed by Montagu on Bryer's authority from Weymouth, and on Laskey's authority as Scotch, is West-Indian. *C. cancellatum* of Brown (having four rows of tubercles on each whorl), said to have been found at Lindisfarne, is likewise tropical. *C. fuscatum* of Linné=*Melania Matoni*, Gray, was given by Pulteney as one of Bryer's Weymouth shells; it inhabits brackish water in Senegal, and is not British.

C. tuberculatum, Linn.,=*C. vulgatum*, Bruguière, was recorded by Pennant as Northumbrian, and by the late Mr. W. Thompson as Irish. These localities are more than questionable, and must have originated in some mistake; but I dredged in the summer of 1865 a few dead specimens on the coast of Jersey. M. Cailliaud states that he has frequently found rolled specimens on the beach in different places of the Département of Loire-Inférieure. I believe the occurrence of this species under the above circumstances in the Channel Isles and Brittany is owing to geological changes, by which the sea-bed has been upheaved and lowered, so as to make the shells semifossil. *C. tuberculatum* is common everywhere in the Mediterranean, Adriatic, and Ægean, as well as on the coasts of Spain, Portugal, and the Canaries, from the shore to 50 f. Sars mentions a specimen having been taken at Bergen from the throat of a codfish.

C. costatum (*Strombiformis costatus*, Da Costa=*Strombus turboformis*, Montagu) should also be rejected as exotic; it is a common West-Indian shell. Dillwyn mistook *C. reticulatum* for this species; Leach was as far wide of the mark in considering it the young of *Aporrhais pes-pelecani*.

C. subulatum (*Murex subulatus*, Mont.) must be consigned to the same limbo. Laskey is reported to have found it at Scalasdale in the sound of Mull!

Family XXVI. CERITHIOP'SIDÆ, Gray.

Contains only the

Genus CERITHIOP'SIS*, Forbes and Hanley.
Pl. IV. f. 5.

Body spiral, elongated: *mantle* plain-edged: *pallial tube* lining the canal at the base of the shell, but not protruded beyond it: *head* short and broad, furnished with a retractile proboscis: *tentacles* cylindrical: *eyes* placed on bulgings in front of the tentacles, at their base: *foot* lanceolate, byssiferous: *opercular* lobe simple. [Teeth 3.1.3; central large, bifid; lateral linear. (Alder.)]

Shell more or less cylindrical and slender, closely tuberculated or beaded, never varicose, nor umbilicate: *spire* tapering to an abrupt but elongated point: *whorls* numerous, the earliest very slender in proportion to the rest: *suture* narrow, excavated: *mouth* small: *canal* extremely short, truncated, and straight: *operculum* horny, ear-shaped, having an incomplete spire; nucleus nearly terminal, at the inner base of the mouth.

The Siphonobranchiata here commence. The shell has a distinct, although exceedingly short canal, instead of a mere groove, as in *Trichotropis* and *Cerithium*; the base of *Cerithiopsis* is truncated, and notched outside, while in the other genera the base is entire. The canal in the present genus and its allies is a semitubular sheath, to receive the branchial fold of the mantle. Montagu pointed out the difference between *Cerithium reticulatum* and *Cerithiopsis tubercularis* in nearly similar terms. Woodward made *Cerithiopsis* a subgenus of *Cerithium*; Clark went further, and merged *Cerithiopsis* in *Murex*. Perhaps the separation of *Cerithium* and *Cerithiopsis* into two families may be an equally extreme mode of classification. The present genus contains many species; and doubtless more have been placed or retained in *Cerithium,* owing to a misapprehension of the distinctive characters.

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* Having the aspect of *Cerithium*.

1. CERITHIOPSIS TUBERCULA′RIS*, Montagu.

Murex tubercularis, Mont. Test. Br. p. 270. *C. tuberculare*, F. & H. iii. p. 365, pl. xci. f. 7, 8, and (animal) pl. OO. f. 1, 2.

BODY white, with three broad longitudinal stripes of dark grey [the lateral ones composed of minute brown points (Clark)], one along the neck, and another on each side: *pallial tube* extremely short: *head* small and compressed: *tentacles* rather short, slightly inflated at the base [" banded or ringed with lead-colour " (F. & H.)]; tips blunt: *eyes* black, placed rather close together [behind each are some sulphur-coloured points (Clark)]: *foot* thick, squarish, and double-edged in front, with small angular corners; from each corner runs a series of transverse flake-white plates (like those of the gill-plume), which are imbedded in the tissue; the foot is usually protruded considerably beyond the head; it becomes attenuated behind, and ends in a blunt point; sole perforated in the middle, whence a narrow but deep groove extends to the tail: *opercular lobe* margined with yellow on each side.

SHELL cylindro-pyramidal, with a narrow and somewhat contracted base, which gives the cylindrical shape; it is solid, opaque, and glossy: *sculpture*, rows of small and close-set tubercles (from 20 to 25 in the lowest row), caused by the mutual decussation of spiral and longitudinal ribs; of these rows there are 3 on the body-whorl, above the periphery; the tubercles on that whorl are oblong, and have their greater axis in the line of the spire (by reason of the transverse ribs being broader there); the other tubercles are granular or bead-like, and proportionally equal in size; each of the preceding 8 whorls has also 3 rows; the first 4 or 5 whorls are quite smooth; the base of the shell (which is slightly excavated) is girded by 2 strong, rather broad and obliquely twisted spiral ridges, one just below the periphery, and the other very short and winding round the canal; occasionally the upper of the basal ridges is indistinctly beaded, and in that case the longitudinal ribs may be traced below it: *colour* dark-chestnut or chocolate: *spire* somewhat turreted; the terminal portion becomes suddenly very much narrower, and consists of 4 or 5 whorls; apex twisted a little downwards: *whorls* 13–14, compressed, the last exceeds one-third of the shell: *suture* narrowly channelled: *mouth* oval, truncated at the base: its length, with respect to that of the spire, is as 2 to 7: *canal* nearly tubular, and exhibiting outside a deep and rounded notch at the base—quite different from what appears in any species of *Cerithium*: *outer lip* semicircular and rather prominent, having a thick edge, which is scalloped by the spiral ridges; inside smooth; this lip is contracted at the upper corner of the mouth into a small sinus (formed by an indentation of one of the ridges), but it does not retreat or slope backwards as in *Cerithium perversum*: *inner lip* rather broad, forming a rather thick fold on the lower part of the pillar, and continuous with the outer lip at the upper corner: *pillar* extremely short, and nearly straight: *operculum* thin, marked with very delicate and minute flexuous striæ; spire excentric, minute. L. 0·25. B. 0·085.

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* Covered with tubercles.

Var. *nana*. Dwarf and spindle-shaped. (Is this the male?)

Monstr. *Clarkii*. Lower and middle whorls having but two rows of tubercles, all of which are oblong; the earlier whorls have the usual number of rows.

Habitat: Under stones in the lower part of the littoral zone, and hard ground in the laminarian and coralline zones, along our southern and western coasts, including the Channel Isles, Bristol Channel, and St. George's Channel, all Ireland, the west of Scotland, and Shetland; Sandwich (Boys, *fide* Montagu). The variety is from Guernsey, Bantry Bay, and other places. The monstrosity was taken by Mr. Clark at Exmouth, and by me at Guernsey. Fossil: "Ireland; Clyde" (J. Smith); Coralline Crag at Sutton (Wood); Belgian tertiaries (Nyst). Its extra-British habitat ranges from Christiansund (Lilljeborg), southward to Fayal in the Azores (Drouet), and throughout the Mediterranean and Adriatic, at depths of from 10 to 60 f.; Charlestown Harbour in South Carolina (C. B. Adams, as *Cerithium Greenei*). Malm found a specimen of the monstrosity at Löken in the south of Sweden, and Martin another in the Gulf of Lyons.

The animal crawls and swims actively and with apparent ease. When at rest, it spins a fine transparent thread, which issues from the opening in the centre of the foot-sole, its end being attached by the point of the foot to some foreign substance. I drew the shell up by this thread with a camel's-hair brush, and kept it thus suspended in the water for several seconds, the foot being doubled up. Several other univalves and many bivalves possess the same faculty of anchoring themselves. There are giants as well as dwarfs among the shells of this species. My largest specimen is barely 3½ lines long; but Mr. Norman has one from the Clyde district measuring half an inch.

Philippi described and figured it as *Cerithium pygmæum*, and Nyst as *C. Henkelusii* (afterwards *Henkelii*); *C. acicula* and *C. minimum* of Brusina appear also to be the same as our species. *Cerithiopsis tuberculata* of P. Carpenter, from the west coast of North America, is different. "The elegant subpellucid white variety" noticed by Montagu as having been found by Laskey near Dunbar, was probably an exotic shell.

2. C. BARLEE'I*, Jeffreys.

SHELL forming an elongated pyramid with a broadish base (which is excavated), thinner than the last species, nearly semitransparent, and glossy: *sculpture*, that of *C. tubercularis*, except in not having any basal ridge, and in the whole surface being marked by numerous microscopical lines of growth; the top whorls are also glossy, but the succeeding two, instead of being smooth, are finely and closely striated in the direction of the spire: *colour* pale yellowish-white, with a faint tinge of brown: *spire* regularly tapering; the terminal portion becomes abruptly narrower, as in the preceding species: *whorls* 12, compressed; the last slightly exceeds one-third of the shell: *suture* deeply channelled: *mouth* irregularly rhomboidal, truncated at the base, but not so abruptly as in the last species: *canal* semitubular, somewhat curved, exhibiting outside a deep and obliquely rounded notch at the base; length of the mouth, compared with that of the spire, as 1 to 4: *outer lip* forming an obtuse angle, with a gentle curve, not prominent, having a thin edge, which is scalloped by the spiral ridges; inside grooved from the same cause; this lip is inflected at the upper corner of the mouth on the peripheral ridge, without forming a distinct sinus, nor does it retreat or slope backwards: *inner lip* rather broad, thicker on the lower part of the pillar, continuous with the outer lip at the upper corner: *pillar* very short, slightly curved: *operculum* thin, yellowish, without any perceptible spire, very faintly striated. L. 0·3. B. 0·1.

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* In memory of my late friend and brother conchologist, Mr. George Barlee.

HABITAT: Among trawl-refuse at Plymouth (Barlee and Jordan); Falmouth (Hockin); Cork (Wright); co. Galway (Barlee and J. G. J.). It is either rare or has not been sought for.

This interesting addition to the European fauna has somewhat the aspect of *Cerithium metula*, which young specimens especially resemble in colour; but the shell of the present species is a pyramid rather than an obelisk, the ridges are more strongly tuberculated, the apex is very different (partaking of the generic character), and there is a true canal. It may be known from *Cerithiopsis tubercularis* by its colour, much wider base, having no basal keel, and by some of the upper whorls being finely striated in the line of the spire.

3. C. PULCHEL'LA*, Jeffreys.

C. pulchella, Jeffr. in Ann. & Mag. N. H. 3rd ser. ii. p. 129, pl. v. f. 8 *a–c*.

SHELL forming a short cylinder, rather solid, nearly semitransparent, and glossy: *sculpture*, 4 spiral thread-like and equidistant ridges on the body-whorl, the uppermost of which is close to the suture and retreats considerably, the lowermost encircles the periphery, and the two middle ones are more prominent; these ridges are crossed by numerous longitudinal ribs of the same size (from 20 to 25 in the lower of the middle rows), which intersect the ridges so as to form a latticework of excavated squares; the points of intersection are sometimes nodulous; each of the preceding 5 or 6 whorls has the upper 3 ridges, and is cancellated like the body-whorl; occasionally the penultimate whorl exhibits the 4 spiral ridges; top whorls smooth; below the peripheral ridge there is a small and very slight ridge or keel, obliquely winding round the base (which is excavated), and the longitudinal ribs are in that part more or less distinct; the whole surface is covered by some fine microscopic spiral lines or striæ: *colour* yellowish-brown, the base having frequently a darker or reddish-brown hue; the body-whorl now and then exhibits two or three obscure bands of the latter colour: *spire* turreted; the terminal portion is pinched up and very small: *whorls* 10, rather convex; the last occupies two-fifths of the shell: *suture* wide and deep: *mouth* obliquely rhomboidal, abruptly truncated at the base; its length in proportion to that of the spire is as 2 to 7: *canal* extremely short, rather more open than in the last two species, producing a corresponding notch at the base: *outer lip* semicircular and somewhat prominent, having the edge scalloped by the four spiral ridges, apparently smooth within; at the upper corner of the mouth it forms a small sinus or indentation as in *C. tubercularis*: *inner lip* narrow and slight, reflected on the pillar, continuous with the outer lip: *pillar* very short, slightly curved: *operculum* filmy, nearly smooth. L. 0·175. B. 0·075.

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* Pretty little.

Monstr. Much narrower, and of an elegant slender shape, quite or almost destitute of longitudinal ribs on the last two whorls, the spiral ridges being consequently very conspicuous.

HABITAT: Coralline zone in Plymouth and Guernsey (J. G. J.); Falmouth (Barlee); Cornwall (Hockin); Turbot bank, co. Antrim (Waller). Villafranca (Hanley). The monstrous form was found by Mr. Hockin at the Land's End; it has some relation, or at least a resemblance, to the *Cerithium trilineatum* of Philippi.

This differs from both the preceding species in its more cylindrical shape, cancellated sculpture, shorter and turreted spire, and in having fewer whorls.

4. C. Metaxa*, Delle Chiaje.

Murex Metaxa, Delle Ch. Mem. iii. p. 222, t. xlix. f. 29–31.

Shell forming an elongated cylinder, solid, opaque, glossy when fresh: *sculpture*, 5 strong and rather broad spiral ridges on the body-whorl, and 4 on each of the other whorls, except on those at the apex, which are quite smooth; the two ridges on the middle of the body-whorl, and the upper two on the other whorls, are more prominent than the rest; all the ridges are crossed by fine longitudinal ribs (about 25 on the lowest ridge), which by decussation produce sharpish tubercles, and give a muricated aspect to the shell; the peripheral ridge, however, is less tuberculated and sometimes smooth; the base (which is rounded in adult specimens) is obliquely girded by a slight ridge: *colour* pale yellowish-brown: *spire* finely tapering, and greatly extended; the terminal part is not so disproportionately small or narrow as in any of the species before described: *whorls* 14–15, convex and rounded, the last occupying one-third of the shell, viewed with the mouth upwards: *suture* wide and deep: *mouth* small, roundish-oval, abruptly and widely truncated at the base; its length in proportion to that of the spire is as 1 to 5: *canal* extremely short, and rather wide, open, and terminating in a deep notch: *outer lip* semicircular, but not prominent; edge scalloped by the five ridges; inside smooth; upper side contracted into a small sinus: *inner lip* rather slight, reflected on the pillar, and continuous with the outer lip at the upper corner of the mouth: *pillar* very short, more or less curved. L. 0·25. B. 0·075.

Habitat: Guernsey, 22 f. (Lukis and J. G. J.); Herm (Barlee and Norman); Land's End, and St. Merryn near Padstow (Hockin); Shetland (Barlee). It is a scarce shell. Coralline Crag at Sutton (S. Wood). Sestri di Levante (J. G. J.); Naples (Delle Chiaje and

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* The name of an Italian naturalist, author of a monograph on the serpents of Rome and its vicinity.

Scacchi); Bona, among coral-refuse (Tiberi); Algiers (Weinkauff); Ægean (Forbes); Pantellaria, Smyrna, Madeira, and Orotava in the Canary Isles (M'Andrew): depths 7–60 f.

It may be known from every other British species of *Cerithiopsis* by its extremely elongated spire, narrow shape, muricated sculpture, having five spiral ridges on the last whorl and four on each of the preceding ones, and by the whorls being convex and rounded.

The synonyms are *Cerithium angustissimum*, Forbes, *C. creperum* and *C. cribrarium*, S. Wood, *C. angustinum*, M'Andrew, and *C. Crosseanum*, Tiberi.

5. C. COSTULA'TA*, Möller.

Turritella? costulata, Möll. Ind. Moll. Grœnl. p. 10.

SHELL resembling in shape a slender obelisk, solid, semitransparent, and glossy: *sculpture*, curved, sharp, and prominent longitudinal ribs; there are about 16 on the body-whorl, which are cut off at the periphery by a spiral ridge, giving the base an angulated appearance; the ribs are traversed and indented by thread-like impressed lines or striæ (3 on the body-whorl, and 2 or 3 on each of the other whorls), besides finer and slighter intermediate striæ in the interstices of the ribs as well as on the base; the latter (which is somewhat excavated) is encircled by a narrow ridge; the second whorl from the apex is closely striated lengthwise, the first being smooth: *colour* white: *spire* finely tapering; the terminal part is very slender in proportion to the rest of the spire; the point is blunt, and obliquely twisted inwards: *whorls* 12, rather convex, the last occupying about one-third of the shell: *suture* wide and deep: *mouth* small, roundish-oval, slantingly truncated at the base; its length, compared with that of the spire, is only as 1 to 6: *canal* short, wide, and open, ending in a deep notch at the base: *outer lip* curved and slightly inflected; edge and inside smooth; upper side not contracted: *inner lip* rather slight, reflected on the pillar, and continuous with the outer lip at the upper corner of the mouth: *pillar* curved. L. 0·4. B. 0·1.

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* Slightly ribbed.

HABITAT: Shetland, 82–86 f., in fine muddy sand (J. G. J.); very rare. Fossil on the Turbot bank, near Larne, 20–25 f. (Hyndman, Waller, and J. G. J.); Boulder-clay, Wick (Peach); Uddevalla (J. G. J.). Living in Upper Norway (M'Andrew and Barrett, as *Chemnitzia elegantissima,* Lovén, Danielssen, and Malm); Väderöarne in South Sweden, 80–100 f. (Malm, as *Cerithium metula,* var.); Iceland (Torell); Greenland (Möller), and in 65 f. (Holböll, *fide* Mörch); long. 54° 33′ W., lat. 55° 36′ N. in 1622 f., from which extraordinary depth a fragment was procured by means of the 'Bulldog' sounding-machine (Wallich).

Mörch changed the name given by the discoverer to *Cerithium arcticum,* because the latter had described the shell as *Turritella? costulata,* it not being Lamarck's nor Risso's so-called species. But the present species is not a *Turritella* (as, indeed, Möller suspected); and the reason assigned by Mörch is, therefore, insufficient. I described the fossil shell as *Cerithiopsis nivea,* and S. P. Woodward proposed to name the recent one *Cerithium Naiadis.*

Family XXVII. BUCCI'NIDÆ, Fleming.

BODY spiral, short: *mantle* large, forming a head-veil in front, plain-edged: *pallial tube* cylindrical, protruded beyond the canal of the shell: *head* small, wedge-shaped: *proboscis* retractile, long, and cylindrical: *tentacles* conical or triangular, separated by the head-veil: *eyes* placed outside, some way up the tentacles: *foot* short: *opercular lobe* roundish-oval and simple: *gills* forming two long unequal-sized plumes: *odontophore* long and straight; central tooth armed below and on each side with spines or crested points, squeezed and bent backwards above; lateral teeth small and separate, each ending in a hook. Sexes separate; verge falciform.

Shell oval, spirally sculptured; base strengthened by an oblique ridge: *epidermis*, if present, velvety or membranous: *spire* short: body-whorl consequently large: *mouth* oval: *pillar* twisted: *canal* short and recurved: *operculum* horny, oval, never spiral, increasing by concentric or elliptical layers; nucleus placed within the edge, at the outer side of the mouth.

The 'Purpurifères' of Lamarck. Adanson noticed that the shell of the male is usually smaller than that of the female, and that the former has a longer spire and more whorls although not so tumid. He included this family and the *Muricidæ* in his genus *Purpura*. Müller outbid Adanson by composing his genus *Tritonium* of the same extensive groups, and throwing *Aporrhaidæ* and *Nassidæ* into the bargain; his *Buccinum* is our *Limnæa*. The egg-cases are membranous; those of *Buccinum* are cup-shaped, and piled one upon another like the cells of a honeycomb; in *Purpura* they are separate, resemble grains of barley, and are placed upright. Although the lingual riband in all the Rhachiglossata (which comprise the Siphonobranchiata) is armed with spinous teeth, none of this division appear to have the jaws (cheek-plates or immoveable mandibles, Mörch) with which the Tænioglossata (including the Pectinibranchiata) are provided. The muscle by which the body is attached to the pillar of the shell in families of the present order is unusually strong.

Genus I. PUR'PURA*, Bruguière. Pl. V. f. 1.

Shell conic-oval, thick, destitute of an epidermis: *spire* sharp-pointed: *whorls* more or less compressed: *outer lip* tuberculated within: *pillar* flattened, sloping inwards with a sharp edge: *canal* narrow.

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* The name of a shell-fish from which the Tyrian dye (*πορφύρα*) was extracted; erroneously applied to this genus.

The *Purpura* of the Romans, from which they procured their famous colour, was *Murex trunculus,* a common Mediterranean shell; it is the principal subject of Colonna's essay. A similar dye is yielded by the two European species of the present genus. It is secreted by an organ which Lacaze-Duthiers considers a kidney, urea having been detected in the liquid by chemical analysis. I shall have occasion to say more about this when I treat of *P. lapillus*. Another point of resemblance, common to the ancient and modern *Purpuræ*, is their power of drilling holes in the shells of other mollusca, for the purpose of feeding on them. The mussel is especially the prey of *P. lapillus*. A living naturalist was mistaken in supposing that it invariably chooses that part of the mussel-shell from which the epidermis had been previously removed—as if the latter could be any impediment to its operations. The late Mr. Osler imagined that "the perforation is effected by a succession of strokes, following each other at intervals shorter than a second:" perhaps he was thinking of a woodpecker. Neither is the discovery of the perforating-faculty possessed by whelks a new one as is generally believed. It was mentioned more than twenty-two centuries ago, by Aristotle, in the 4th chapter of the 4th book of his wonderful 'History of Animals.' He there describes the stout proboscis of the πορφύρα (which he compares to that of the gadfly) and its use, as well as its sharp minute and slender teeth, like those of snails. Nor was he ignorant of its acute sense of smell, evidenced by the πορφύρα being attracted from a considerable distance by the bait laid for its capture. He likewise noticed the honeycomb-mass of spawn deposited by that shell-fish; and all his observations are marked by a degree of accuracy which scientific men now-a-days might well endeavour to emulate. What does Shakespeare say of the boasted discoveries of the present age?

> "If there be nothing new, but that, which is,
> Hath been before, how are our brains beguil'd,
> Which, labouring for invention, bear amiss
> The second burden of a former child!"

PURPURA LAPIL'LUS*, Linné.

Buccinum lapillus, Linn. S. N. p. 1202. *P. lapillus*, F. & H. iii. p. 380, pl. cii. f. 1–3, and (animal) pl. LL. f. 4.

BODY varying in colour from white to yellowish, with a faint tinge of brown, and minutely speckled with flake-white: *mantle* thick, with sometimes a brown margin: *pallial tube* short, not much nor often protruded: *head* small: *proboscis* short: *tentacles* conical, rather long and tapering; the part above the eye is much more slender than the lower part (which is tumid and rounded), and is from one-half to one-third of the entire length: *eyes* small, although conspicuous from their dark colour, slightly raised on long and thick stalks ("ommatophori," Lovén), which are amalgamated with the lower part of the tentacles: *foot* oblong, rounded at each end, or bluntly angular behind, double-edged in front, with ear-shaped corners; sole divided lengthwise by a slight fold or crease: *opercular lobe* short.

SHELL forming a short cone with a bluntly pointed base, thick, opaque, nearly lustreless: *sculpture*, numerous flattened spiral ridges, which are sometimes thread-like, or alternately large and small, and always become sharper near the apex; the surface is also covered with rather close-set striæ in the line of growth; these latter are sometimes wavy where they are interrupted by the spiral ridges, so as to produce a more or less distinctly fimbriated appearance; embryonic whorls quite smooth and glossy; the base is encircled by an obliquely twisted keel: *colour* most variable, usually whitish, pale orange, reddish-brown, or dark chocolate, often banded, and the base stained with reddish-brown; one specimen (from Shetland) has the body-whorl white and the upper whorls marked with narrow brown bands in the interstices of the ridges: *spire* regularly but suddenly tapering; apex blunt and rounded, twisted on one side: *whorls* 6–7, convex, although compressed upwards; the last occupies from two-thirds to five-sixths of the shell: *suture* rather slight, deeper towards the apex: *mouth* oval, somewhat contracted by the pillar; its length is from one-half to two-thirds of that of the spire: *canal* deep, exhibiting outside a corresponding and oblique notch: *outer lip* curved, bevelled on the inside to a rather sharp edge (which is slightly indented by the ridges in young shells), notched or tuberculated within, sloping above from the periphery: *inner lip* broad, continuous with the outer lip at the upper corner of the mouth: *pillar* broad and smooth, angulated where the canal begins; between the lower part of the pillar and the basal ridge there is an oblique cavity as in *Trichotropis*: *operculum* dark horn-colour; lines of increase distinct; nucleus placed nearer the base than in the middle of the outer side; it exhibits underneath four or five irregularly elliptical layers, being apparently the marks of annual growth. L. 1·5. B. 1.

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* A pebble.

Var. 1. *imbricata*. Longitudinal striæ more developed, and forming a flounce-like ornamentation. *P. imbricata*, Lam. An. s. Vert. vii. p. 244.

Var. 2. *major*. Larger and having a longer spire. L. 2·5. B. 1·25.

Var. 3. *minor*. Smaller, more strongly ridged, with a shorter spire and wider mouth. L. 0·75. B. 0·5.

Monstr. Spire reversed, scalariform, or having scarcely any canal.

HABITAT: Gregarious everywhere on rocks and stones, exposed to the tidal waves of

> . . . . . "the sea, that fleets about the land,
> And like a girdle clips her solid waist."

Here it gets abundance of food, which mainly consists of mussels, limpets, and sessile barnacles. It sometimes finds its way into deeper water. The 1st variety was dredged by Mr. M'Andrew on an oyster-bed from 4 to 7 f. in Rhoscollyn Bay, near Anglesea; Mr. King, the natural-history dealer, also found it near Holyhead, and Dr. Knapp in the Firth of Forth. Var. 2. Off the Mumbles Head, near Swansea, in 18 f. (J. G. J.). Var. 3. Burrafirth Caves, Shetland (J. G. J.). A specimen of the reversed monstrosity is in the collection of the late Mr. Bean at Scarborough. Many years ago he sent his little granddaughter to the pier on an errand, and on her return he scolded her for loitering. She held up her pinafore to wipe her eyes, when down fell some of these whelks which she had picked up; his quick eyes lit on a left-handed specimen, and it is needless to say that he at once forgave her. A scalariform specimen occurred to me in Swansea Bay; and one almost without a canal was given to me by Mr. Dillwyn as Irish. The last may possibly be a hybrid between this species and a *Littorina*. *P. lapillus* has been recorded as fossil in the Red Crag and every subsequent deposit, including Moel Tryfaen; post-glacial formation in Norway, 0–100 feet (Sars). Its foreign distribution in a living state comprises the Arctic seas of both hemispheres, the European coasts of the North Atlantic (0–20 f.) southwards to Santander (E. J. Lowe), Corunna and Vigo (M'Andrew); Mogador, a dwarf state or variety, abundantly, with *P. hæmastoma* (R. T. Lowe); Canada (D'Urban); United States (Gould and others); Mexico (Brit. Mus.); north-west coast of America (P. Carpenter). Senegal, Teneriffe, and Fayal in the Azores, as well as the coast of Brittany, are given by Adanson as localities for the present species; he also described and figured *P. hæmastoma*. The variety *imbricata* was noticed by Fabricius as Greenlandic; and I have taken it in the south-west of France.

This mollusk has a shambling gait, and sedentary habits; it seems to be always eating, or digesting its food. Lister, however, observed it early in the morning, at the commencement of June, otherwise engaged, viz. in perpetuating its species on a dry rock after the tide had receded. It is very destructive to mussel-beds, and is said by Linné to eat the dead fish left in fishermen's nets. I have seen it busily feeding on *Balanus balanoïdes,* its strong proboscis being inserted between the opercular valves of the barnacle. According to Mr. Osler, it also devours *Littorinæ, Trochi, Naticæ,* and even its own kind. From what I have observed of the mode by which it perforates the shell of a mussel, I am inclined to agree with Mr. A. Hancock that it uses its tongue. The siliceous spines with which this organ is closely studded would scrape a hole in any layer of carbonate of lime, however compact. I cut off the end of the proboscis of a *Purpura,* while it was attacking a mussel; the part thus lopped still remains in the hole, with the front of the tongue exposed. The hole is shaped like an inverted cone, and exhibits under the microscope extremely fine scratch-like striæ, as if caused by the rasping action of the lingual apparatus. I believe the movement to be rotatory, because the sides of the hole are quite even. The process is an extremely slow one. Mr. Osler states that, after watching for some hours a *Purpura* attached to a limpet, he found the perforation incomplete; and Mr. Spence Bate and Mr. Bretherton noticed that it took two days to get through the shell of a moderate-sized mussel. It does not appear that the prey is destroyed by any poisonous secretion of the whelk, after it has gained access to the interior. The proboscis is at first thrust into the hole which it had drilled, and the whelk eats in that way; but when, from the death of the mussel or limpet, the former gapes or the latter separates from the rock, the *Purpura* devours the remainder by the natural opening. Perhaps they exercise some abstinence in the winter and early spring, to make up for their continual gormandizing during the warmer portion of the year. Mr. Peach informs me that on the coast of Caithness, throughout the winter, the *Purpuræ* assemble in clusters low down towards the sea, where they are left dry at spring tides only, and that they also huddle together in crevices of the rocks; he could hardly find a single individual in the usual summer habitat in the course of an hour's walk which he took along the shore in the middle of March. Their voracity and cannibal propensities begin at a very early age. Dr. Carpenter has shown (and his observations are confirmed by Mr. Busk, Professor Huxley, and Dr. Dyster) that the embryo of *P. lapillus*, before it leaves the nidus or capsule, swallows the yelk around it. The observations of Claparède on the development of *Neritina* coincide with those of Carpenter as to *Purpura.* Koren and Danielssen, however, give a different account of the matter. They say that each capsule is at first hermetically closed, and filled with a liquid, which is as transparent as water, viscous, and resembles the white of a bird's egg; in this liquid are enveloped a mass of eggs, 60 or even more; in process of growth these eggs agglomerate, and form from 20 to 40 embryos, which are developed in the same manner as those of *Buccinum undatum*, the shell taking the shape of a *Nautilus*, and that at the end of the 9th or 10th week, and not before, the fry quit the capsule. The latter then bursts at the top, and shows an open split. The capsule adheres to the rock, sometimes to *Balani* or to the shells of other *Purpuræ*, by a short and narrow stalk, which is connected with a membranous and broad base; each is distinct and separate. They are slightly striated across. At one time they were classed among the Polypes, and called *Hydra triticea*; Ellis gave them the name of sea-cups. Mr. Peach has furnished some interesting particulars of the embryogeny of *P. lapillus*.

According to him it deposits its spawn all the year round, but more actively from January to April. Spawn which he collected in January 1843 was hatched four months afterwards; he took 47 fry from a single capsule. They soon began to assume the peculiar habit of their parents, "by getting out of the water, where they would remain for hours, answering to the period of the ebb and flow of the tide." Cailliaud counted 245 capsules which had been produced by a single *Purpura* about the same time; each capsule contained from 16 to 28 perfect embryos [making therefore an average total of 5390]: they were hatched in turn by the parent, which (as he supposes) thus not only supports them by her nutritious moisture, but protects them against accidents. I have only seen the *Purpura* covering with her shell the egg-cases while they were being laid. M. Cailliaud adds that some of the inhabitants of St. Michel-Chef-Chef eat this shell-fish after the spawning-season. It does not seem to be anywhere else an article of food—although our remote ancestors were probably less fastidious in their tastes; for the shells are found in the refuse-heaps or kitchenmiddens of 'Picts' houses' near Wick, mixed with shells of the common periwinkle, and occasionally of the limpet and mussel. Within the period of civilization this mollusk has been made useful in another way; and a great deal has been published concerning the purple dye which is yielded by our *Purpura*, as well as by that of the Greeks and Romans. The Venerable Bede mentions it, in terms of admiration, in his Ecclesiastical History of England: as to its permanency, he says, "quo vetustior, eo solet esse venustior." The subject has been since discussed, in both an economical and philosophical point of view, by a crowd of writers, English, French, Norwegian, Spanish, Italian, German, and Dutch, each contributing something to our knowledge. Professor Lacaze-Duthiers has lately given an excellent résumé. From all these publications and my own observations I may state that the dye-stuff, when extracted from the living animal, is of the consistency of cream, and at first colourless or more or less yellowish; exposed, in a moist state, to the light of the sun, it passes through all the different shades of green to violet, then to a beautiful purple, and ultimately becomes crimson; the colour is photogenic or produced by solar action. A smell of garlic is given out during the process. Linen was formerly stained or marked with it. The liquor contained in the egg-capsules is also purpuriferous, and tastes like the strongest pepper. *P. hæmastoma* and *Murex erinaceus* possess the same colouring-matter. When amusing himself by some experiments as to the faculty of hearing possessed by the mollusca, Dr. Johnston ascertained that neither this kind of whelk, the periwinkle, nor the common banded snail appeared to be affected by loud and harsh noises about them. M. Susini, however, informs me that at Corsica *Trochus tessellatus* or *T. fragarioïdes* (which is there gathered by the fishermen, and after being scalded eaten with a pin, like our periwinkle) invariably drops down from the rock when any one approaches it. The shell of the male *P. lapillus* is longer, more slender, and has a finely tapering spire, with a plicated but not tubercular throat. Specimens from brackish water in the Solent and River Orwell are smaller and of a thinner texture. In one from Guernsey there is a strong fold on the upper part of the pillar, extending inwards. Occasionally the shell is truncated at the top, or the first whorls are broken and deserted, the animal occupying the remainder. In aged specimens the throat has not unfrequently a succession of tubercular rows, forming internal varices. None of the specimens which I have seen from Canada and the United States are as large as ours; and I am consequently disposed to take a view opposite to that which Forbes suggested, viz. that this species is of American origin, and was introduced to the European shores during the glacial epoch. The common character of the fossils of that period in both continents shows that a close connexion by continuity then existed throughout the circumpolar area; and there is no evidence that any migration took place from one continent to the other. We must go back to the antecedent epoch in order to trace the origin of this species; and we there find that it occurs for the first time in the Red Crag of Suffolk. It is remarkable how the numerous varieties figured by Mr. Searles Wood from that formation correspond with those of the adjacent coast.

The present species was named by Lister *Purpuræ anglicanæ*, or "white couvins;" it is the *Buccinum Cornubiense* of Petiver, "le sadot" of Adanson, "the purple-marking whelke" of Borlase, *B. purpuro-buccinum* of Da Costa, *B. anglicum* of Gmelin, and *B. anglicanum* of Lamarck; the vulgar name in Ireland, according to Smith and Rutty, is "horse winkles:" the fry is probably *B. breve* and *B. læve* of Adams's papers in the 'Linnean Transactions.' The *P. lapillus* of Risso is *Buccinum hæmastoma* of Linné. This latter species inhabits the North Atlantic, from Brest southwards to the Azores (including the coast of Senegal), as well as the Mediterranean and Archipelago; Mörch gives the Brazils as a locality, in the sale catalogue of the Count de Yoldi's collection of shells. Between forty and fifty years ago Mr. Charles Macculloch picked up three specimens of this shell near St. Peter's Port, Guernsey, at the lowest point of a spring tide. Mr. Lukis had these specimens; two were living, and are now in his or his late son's collection; the third (which was dead) Mr. Lukis kindly presented to me. Not being an eatable shell-fish, French sailors would hardly take the trouble of bringing it from the coast of Brittany, and throwing it overboard, for the purpose of puzzling English conchologists.

Genus II. BUC'CINUM*, Linné. Pl. V. f. 2.

SHELL oval, not so thick as that of *Purpura*: *spire* bluntly pointed: *whorls* more or less tumid: *outer lip* sometimes slightly grooved within, never tuberculated: *pillar* rounded: *canal* wide.

The *bucca* or *buccina* of the Romans was the same as the *κήρυξ* of Aristotle and the Greeks, and represented the large *Triton nodiferus*, which was the trumpet used in land- and sea-fights, as well as for setting the watch and calling together assemblies of the people:—

> "Buccina cogebat priscos ad verba Quirites."

This line of Propertius was misquoted by Linné (who was apparently misled by Buonanni), so as to make the *buccina* a war-trumpet only. The type of the present genus, as established by Linné, is our common whelk†, *B. undatum*. It has been grotesquely metamorphosed into an heraldic emblem, and forms part of the armorial bearings of the ancient family of Shelley. In blazoning their coat of arms, old Gwillim enjoins us to glorify God for the infinite variety of Nature's workmanship, "manifest even in the very shells of fishes," which he considers "things of meanest reckoning." In his orderly fashion he placed these in the lowest rank, but the cherub, unicorn, and phœnix foremost in the scale of creation. The *Buccina* affect principally, if not exclusively, the temperate and colder seas of both hemispheres. Dr. Stimpson has given a review of the northern species in the 'Canadian Naturalist' for October 1865. Whether all those which he reckoned distinct will stand the test of a more extensive examination of this extremely variable group is questionable.

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* Corrupted from *buccina*, the classical name of a shell-trumpet.

† An old English word:—

"Horns whelk'd and wav'd like the enridged sea."—*K. Lear*, iv. 6.

1. Buccinum unda'tum*, Linné.

B. undatum, Linn. S. N. p. 1204; F. & H. iii. p. 401, pl. cix. f. 3, 5, and (animal) pl. LL. f. 5.

Body varying in colour from dirty white to yellowish, speckled or streaked with black: *mantle* rather thick, folded over the pillar of the shell: *pallial tube* extensile, protruded an inch or more beyond the canal, recurved, and obliquely truncated at the extremity: *head* small, narrowish: *proboscis* very long and powerful, enclosing a muscular sheath, within which lies the tongue: *tentacles* flattened, long, and pointed, abruptly thickened at the base: *eyes* very small, placed nearly one-third of the way up the tentacles: *foot* oblong, with shelving sides, capable of considerable expansion and distention, rounded in front, with small ear-shaped corners, and bluntly pointed behind: *verge* large and fleshy, with a short point at the extremity [: *odontophore*; central tooth armed with 7 cusps or points in a comb-like manner; shaft of the side tooth having 3 notches, the lowest being the largest. (Lovén)].

Shell conical above the periphery or centre of the body-whorl, and somewhat truncated at the base, more or less solid (according to the habitat), opaque, and usually lustreless: *sculpture*, numerous fine thread-like spiral ridges, some of which are much stronger than others and are arranged in bands (from 3 to 7 small ridges between every large one); the whole surface is covered with extremely delicate and close-set longitudinal striæ, which seldom, however, cross the spiral ridges so as to cause any decussation; the upper portion of the body-whorl and of the four or five preceding whorls is often strengthened by curved ribs or folds (like buttresses), of which there are from 12 to 15 on the penultimate whorl; top whorl smooth; the base is girded by a very large, strong, and obliquely twisted keel: *colour* mostly yellowish-white, tinged with reddish-brown, sometimes white banded with the latter colour, or reddish-brown with a pink tinge and beautifully mottled with white; inside yellow, white, pale reddish-brown or chocolate: *epidermis* pale brownish-yellow, rather thin, usually rising into close-set laminar folds, corresponding with the longitudinal striæ, which form short spinous processes on the spiral ridges: *spire* regularly tapering; apex blunt and irregular, or mammiform: *whorls* 7–8, rounded; the last occupies about two-thirds of the shell: *suture* deep: *mouth* oval, and somewhat expanded; length about one-half that of the spire: *canal* open and deep, exhibiting outside a similar and oblique notch: *outer lip* semicircular, flexuous, and having a large sinus or bay in the middle; it slopes outwards from the periphery; edge reflected and thickened in full-grown specimens; inside slightly and indistinctly grooved: *inner lip* broad, consisting of a rather thick glaze on the pillar and adjacent part of the body-whorl: *pillar* smooth and highly polished, microscopically freckled or pustulated by the lower fold of the mantle: *operculum* pale brownish-yellow, rather solid, more or less concave towards the nucleus; the layers of growth are laminar and numerous, resembling the epidermis in texture. L. 3·25. B. 2.

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* Waved.

Var. 1. *flexuosa*. More slender, with a produced spire; whorls apparently twisted, in consequence of the ribs being obliquely curved.

Var. 2. *littoralis* (King). Ventricose; spire shorter, and body-whorl disproportionately large; longitudinal plaits strong; throat often coffeecoloured.

Var. 3. *paupercula*. Dwarf and depauperated.

Var. 4. *striata*. Thinner than usual, with the longitudinal ribs nearly obliterated. (*B. striatum,* Pennant, Br. Zool. iv. p. 121, t. lxxiv. f. 91.)

Var. 5. *pelagica* (King). Twice the usual size, and also thinner, with a longer spire and proportionally smaller mouth.

Var. 6. *Zetlandica* (Forbes). Smaller, and of a thin and delicate texture, destitute of longitudinal ribs; epidermis smooth and membranous.

Monstr. 1. *sinistrorsum*. Spire reversed. 2. *carinatum*.

Upper part of each whorl encircled by a keel or more prominent spiral ridge. (*B. carinatum*, Turton, Conch. Dict. p. 13, pl. xxvi. f. 94.) 3. *imperiale*. Body-whorl compressed and elongated, so as to give it the shape of a *Voluta*. (*B. imperiale*, Reeve, Conch. Icon. iii. pl. ii. f. 8.) 4. *acuminatum*. Spire extending to a considerable length; whorls flattened, and the periphery consequently angulated. (*B. acuminatum*, Broderip in Zool. Journ. v. p. 44, pl. iii. f. 1, 2.) 5. *conico-operculatum*. Operculum patelliform or conical. 6. *bioperculatum* and *trioperculatum*. Having two or three opercula.

Habitat: Every kind of ground, in all parts of the British seas, from the shore to the greatest known depth. The 1st variety is peculiar to hard ground in the coralline zone, throughout the Hebrides, Orkneys, and Shetland; it is not common. 2nd, among stones and on mud, in the higher part of the laminarian zone, north of England, as well as Ireland, Scotland, and Shetland. 3rd, brackish water at Southampton and Ipswich. 4th, coralline zone of England, Wales, and Ireland; not common. 5th, Dogger bank; Mr. Leckenby has a specimen 6½ inches long. 6th, soft ground in the deep-water zone, west of Ireland, outer Hebrides, Orkneys, and Shetland; I have a specimen of a pure white colour. Besides these, which I regard as the principal varieties, others have been described by Professor King and Mr. A. Hancock. In horticultural language, the species is very much given to sporting. The monstrosities have been noticed in the following places:—1, coasts of Kent, Sussex, Lincolnshire, and Yorkshire; it is the *B. Bornianum* &c. of Chemnitz. I have both solid and thin specimens of this monstrosity. 2, with the last, and at Exmouth, Sunderland, and in the west and south of Ireland; not *B. carinatum* of Phipps, which is *B. glaciale*. 3, Kent and Sussex. 4, the same, and in various other places, as far north as Aberdeen (Macgillivray); this was mistaken by Turton for *B. glaciale*; the upper whorls are more or less regular. 5 and 6, Kent and Sussex; in a bioperculate specimen, procured by Mr. Rich, one of the opercula is conical and borne on a cylindrical stalk-like lobe, the other being of the usual shape; in a second specimen one operculum is longitudinally oval with the nucleus nearly terminal (as in *Fusus*), the fellow operculum being placed at a right angle to it. Other monstrosities are found, of a less marked kind. Every abnormal growth of the shell can be distinguished from those of a specific or varietal sort by examining the apex or nucleus; this will be seen to be regular, the malformation having subsequently taken place, and being in most instances caused by some injury to the outer edge of the mantle. The typical form and variety *striata* have been recorded from every recent geological formation in the northern latitudes of both hemispheres, and as far back as the Coralline Crag; Palermo (Philippi). Mr. James Smith found the monstrosity *carinatum* fossil at Bute, and Mr. Grainger at Belfast. The geographical range of the species at the present time appears to be restricted to the North Atlantic, from the North Cape (Sars) and Iceland (Steenstrup) to Rochelle (D'Orbigny père and Aucapitaine), and Massachusetts (Gould); Gulf of Lyons, in the stomach of a *Trigla gurnardus* (Martin). The variety *Zetlandica* is Scandinavian, and was mistaken by Lovén and others for *B. Humphreysianum*; Iceland (Torell). The monstrosity *acuminatum* was procured by the late M. Bernardi in the north of France. American specimens of the common sort are smaller than European; and Stimpson endeavours to show that they belong to distinct species, because of "a *facies* difficult to describe." If the supposed difference cannot be defined by any words or delineation, and the only substitute offered is the nearly exploded idea of representation of species, it is a pity that naturalists should be so unnecessarily perplexed.

In Scotland and Shetland this common shell-fish is called "buckie," in the Isle of Man (according to Forbes) "mutlag," in Holland "wulk" (Born), in France "bouche-aurore" (Lamarck), at Brest "grosse bigorne" and at Rochelle "burgau morchon" (De Montfort), and in La Manche "ran" (De Gerville). The animal emits a thin and copious slime. From its size and toughness it makes a good subject for anatomical demonstration—although Cuvier has left very little to be known about that part of its history. It burrows in the sand, like *Natica catena*; and its foot is similarly traversed by numerous canals, which admit of its being distended by water: this enters by an orifice at the upper corner of the mouth of the shell, and finds its way, through the abdominal cavity, into the vascular system of the foot. When it burrows, the end of the pallial tube or siphon is either exposed or but slightly covered by the sand, so as to supply the gills with water or air as the case may require. Beudant's experiments show that it cannot live in fresh water. The formation of two opercula by the same individual appears to be congenital, and not owing to an injury of the opercular lobe, which would cause an aborted or defective growth; for in some of these monstrous specimens the twin opercula are so large that they are doubled or folded inwards, side by side, in order to fit the mouth of the shell. This mollusk is very voracious, and is often caught on the fishermen's hooks. Örsted tells us, in his interesting treatise "De regionibus marinis," that great numbers of *B. undatum* and *Fusus antiquus* are collected in the Cattegat for fish-bait, by putting a dead cod into a wicker basket and letting it down on a muddy bottom; it is soon taken up half filled with whelks. The same method is adopted for their capture on the English and Irish coasts. The whelk affords an illustration of the *lex talionis*; fishes in their turn devour it with equal greediness. I have seen between 30 and 40 shells of *B. undatum* extracted from the stomach of a single cod. After the shell has been cleared out and ejected by the fish, it makes a convenient habitation for the hermit-crab. Other nations have not quite so great a fancy as ours for eating the whelk: perhaps it is an indigenous taste; for when the Romans were in this country, they seem to have acquired it—being one which they could not gratify in Italy. Shells of *B. undatum*, mixed with those of the oyster, have been noticed among the ruins of a Roman station at Richborough. At the enthronization feast of William Warham, Archbishop of Canterbury, on the 9th of March 1504, there were provided "8000 whelkes at 5*s*. ℔ 1000." In the shell-fish market at Billingsgate the present species goes by the name of the "white" or "common" whelk, in contradistinction to *Fusus antiquus*, which is there called the "red" or "almond" whelk; they are brought chiefly from Whitstable, Ramsgate, Margate, Grimsby, and Harwich. My obliging informant Mr. Baxter says, "Wilks must be sold the same day we receive them at market in the summer, being the day after they are caught; if the supply is greater than the demand, we boil them, and they keep good for several days." Evidence was given before a select committee of the House of Commons in the Session of 1866, on the 'Whitstable oyster-fishery extension Bill,' that the whelk-fishery on a sandy flat in that bay yielded £12000 a year,—part of the produce being disposed of in the London market for food, and the rest sent to the cod-fishing banks for bait. They are seldom eaten in the northern part of our isles. At Dieppe and Nantes they may occasionally be seen exposed for sale in the fish-markets. The embryology of *B. undatum* has been investigated by Baster and many other writers. Its curious spawn-cells are figured in Ellis's 'Corallines' as "*Alcyonium*, seu *Vesicularia marina* of Bauhin;" they were also called "Sea wash balls," because of their being used instead of soap by sailors to wash their hands. Dr. Johnston compares this vesicular mass to the nest of the humble-bee. It is composed of numerous cartilaginous pouches, of the shape and size of a large split pea, piled irregularly one upon another, and attached by their edges at the base. Cailliaud counted 544 of these cells in one of the spawn-masses. Each cell contains at first several hundred eggs, which are afterwards so greatly reduced in number that only from 15 to 30 fry come to maturity. The process by which this reduction takes place has been disputed by Scandinavian and English physiologists, not less as to *Buccinum* than with respect to *Purpura*. Koren and Danielssen state that the eggs are at first spherical, that they afterwards separate into distinct portions, and then amalgamate or agglomerate and assume a different shape. Sir John Lubbock, on the contrary, ascertained that the more advanced embryos swallow the other yelks whole, and in such quantities as to become greatly distended; his paper in the 'Report of the British Association' for 1860 contains a representation of "a young embryo in the act of swallowing an egg." Dr. M'Intosh observed two specimens of the variety *littoralis*, on the 19th of October 1863, in the act of depositing spawn under a stone, about midtide, in a rock-pool at St. Andrews. An egg-case, extruded from one of these whelks, which he held in his hand, was quite soft, and fell into the water like a ball of jelly. Before the fry leaves its cell, it is furnished with two rounded and ciliated lobes in front, a proboscis, eyes, foot, gills, heart, otolites or ear-stones, and other organs, besides a perfectly formed shell of two whorls and an operculum. The spawning-season takes place, according to the latitude and climate, between October and May; about two months are required for the development of the fry. The shells vary exceedingly in thickness; some are solid and coarsely ribbed; others are thin, and their sculpture is very delicate. Sometimes the top of the shell is broken off, and the opening is closed by a plug. In young specimens the nucleus of the operculum is more central than in the adult, the lateral extension of growth being inwards or towards the pillar. Mr. Dennis and Mr. Norman believe that the scalariform distortion of the whorls, which is not unfrequent, is occasioned by an annelid occupying the suture; but the epidermis in such cases may be traced covering that part, and the distinction between *post hoc* and *propter hoc* may apply to the opinion of the above naturalists, as well as to the arguments of lawyers. The shell is the "roaring buckie" of Scotch bairns. Wordsworth has amplified this idea in the following pretty lines:—

> "I have seen
> A curious child, who dwelt upon a tract
> Of inland ground, applying to his ear
> The convolutions of a smooth-lipp'd shell;
> To which, in silence hush'd, his very soul
> Listen'd intensely, and his countenance soon
> Brighten'd with joy: for murmurings from within
> Were heard,—sonorous cadences, whereby,
> To his belief, the monitor express'd
> Mysterious union with its native sea."

Landor's verses express a similar idea as entertained by children of a larger growth. In the 30th Problem of Buonanni will be found a satisfactory explanation of this phenomenon, on acoustic principles.

It is the *B. vulgare* of Da Costa, *B. porcatum* of Gmelin, and *B. Labradorense* of Reeve. The *Tritonium undatum* of Fabricius is *B. Grœnlandicum*.

2. B. Humphreysia'num*, Bennett.

B. Humphreysianum, Benn. in Zool. Journ. i. p. 298, pl. xxx. (upper figures); F. & H. iii. p. 410, pl. cx. f. 1.

Body whitish or yellowish-white, speckled with black: *pallial tube* cylindrical: *tentacles* conical, contractile and therefore varying in length, widely diverging, and separated by an intermediate membrane: *eyes* on short stalks or protuberances: *foot* broadly lanceolate, rounded or slightly bilobed in front, with a small triangular process at each corner, bluntly pointed behind.

Shell of a more regularly oval shape than *B. undatum*, thin, but nearly opaque, somewhat glossy: *sculpture*, numerous and delicate, wavy, spiral impressed lines or striæ, visible only with a magnifying glass; the surface is also covered with still finer, slighter, and much more numerous longitudinal striæ, which require a stronger power to observe them; no distinct reticulation is produced, but the interstices of the spiral striæ are microscopically punctured: *colour* yellowish or whitish, mottled with fawn or reddish-brown, or irregularly banded with rows of spots or chain-like markings of the last colour: *epidermis* none: *spire* rather short, regularly tapering; apex blunt and depressed: *whorls* 7–8, rounded and convex; the last occupies more than three-fourths of the shell: *suture* deep: *mouth* forming an obtuse angle on the inner or columellar side, contracted above into an acute angle, and expanding outwards with a curved outline; length about five-ninths that of the spire: *canal* wide, open, and deep, exhibiting outside a corresponding notch: *outer lip* semicircular, flexuous, scarcely sinuated in the middle, sloping outwards from the periphery; edge in full-grown specimens reflected; inside smooth: *inner lip* imperceptible, consisting merely of a slight glaze which imparts a polished appearance to that side: *pillar* microscopically pustulated: *operculum* very small, triangular, with a rounded outline, not very thin, somewhat concave; lines of growth fibrous and close-set. L. 1·75. B. 1.

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* Named in honour of the late Mr. J. D. Humphreys, a conchologist at Cork.

Var. *lactea*. Milk-white.

HABITAT: The outer "haaf" or fishing-banks, east and north of the Shetland Isles, in 73–90 f.; also in Vidlom voe on the mainland of Shetland, 18 f. (Norman); Hebrides (Forbes, M'Andrew, and Barlee); co. Cork, 40 f. (Humphreys and Armstrong); Connemara (Professor King). ? Fossil in Palermo and Calabria (Philippi, as *B. striatum*). Living in Manger fiord (Sars, mus. Christ.). The shells received by the late Mr. G. B. Sowerby from Newfoundland, and referred by him to this species, appear to be *B. Grœnlandicum*; and the same remark applies to those recorded by Professor Geikie from the Clyde beds. Dr. Stimpson must have mistaken some other species (perhaps *B. ciliatum*) for *B. Humphreysianum* when he described the latter as having a ciliated epidermis; and I therefore cannot recognize the North American localities indicated by him. *B. ventricosum* of Kiener (from the coast of Provence) is closely allied to our shell; but the whorls are more tumid and gibbous, and the operculum is not so disproportionately small. They bear the same relation to each other as *Aporrhais Serresiana* does to *A. Macandreæ*.

This shell differs from the variety *Zetlandica* of *B. undatum* in its more regularly oval shape, thinner texture, much finer sculpture, entire absence of an epidermis, not having a basal keel or an inner lip, and in its extremely small and triangular operculum; from all the other varieties it is easily known by its far greater delicacy, the want of longitudinal ribs, and remarkable style of colouring. The operculum bears the same proportion to the size of the mouth as that of *Aporrhais*; it seems to be more ornamental than useful, like the coquettish hats worn by the girls of Tuscany on the crown of their heads. The opercular lobe covers only the centre of the operculum, the upper and under sides of which are sometimes encrusted with sessile Foraminifera. The egg-cases are separate and hemispherical. Some of the above characters are so peculiar as perhaps to warrant the generic separation of *B. Humphreysianum*—under the name of *Mada,* its surface being glabrous.

It is the *B. Puxleianum* of Leach; not *B. Humphreysianum* of Möller, Lovén, Middendorff, Sars, Danielssen, or Malm. Forbes (Mem. Geol. Surv. pp. 381 and 426) hastily considered it identical with the *B. ciliatum* of Fabricius; his suggestion that the *B. fusiforme* of Broderip (which is a true *Fusus*) may be "an extreme form" of the same species is equally inexact.

The following are spurious or not British:—

B. glaciale, Linn.=*B. carinatum,* Phipps., "Orkney Islands, Mr. Agnew, gardener to the Duchess of Portland" (Donovan); in the Portland-sale catalogue it is stated to be from Greenland, which is the true habitat. Fleming's Zetlandic specimen was, I believe, given to him by the captain of a whaler.

B. Grœnlandicum, Chemn., with no end of synonyms, is one of our glacial fossils; it does not now live south of Finmark. Fabricius broached an odd idea, that by means of the pallial tube (which he called a *cirrus*) the animal was accustomed to catch hold of the leaves of fuci, so as to facilitate its progress, and when that prehensile organ was not used it did not get on so well!

B. ciliatum, Fabr. With *Scalaria Grœnlandica*, from Shetland (Bean): Greenland. See p. 97 of this volume.

B. plicosum, Menke=*Fusus cinereus*, Say=*F. Forbesi*, Strickland. Isle of Man (Forbes): Arctic Ocean and United States. See vol. ii pp. 58 & 59.

Dolium perdix, Linn. Weymouth (Pulteney) and Jura (Laskey): South-European and African.

Cassis testiculus, Linn. (young), *B. decussatum*, Penn. =*B. porcatum*, Pult. Weymouth (Pennant); Firth of Forth (Laskey); Plymouth (Lambert, *fide* Fleming): West-Indian.

Family XXVIII. MURI'CIDÆ, Fleming.

Body spiral, usually long: *mantle, pallial fold, head*, and *proboscis* as in the last family: *tentacles* forming an elongated cone: *eyes* on stalks, which are combined with the outer part of the tentacles and placed some way up the latter: *foot* lanceolate, longer than in the other family: *opercular lobe, gills*, and *odontophore* as in the *Buccinidæ*. Sexes separate.

Shell conic-oval or oblong, variously sculptured: *spire* produced: *mouth* oval: *pillar* not twisted: *canal* more or less extended: *operculum* horny, never spiral, increasing by semi-elliptical or curved layers; nucleus terminal.

This huge collection of mollusca has been divided, for scientific convenience, into many genera, which are distinguishable solely by their shells, never by their soft parts. Still, mere conchological characters, and even the structure of the operculum, are in some cases not less useful for the purpose of classification than characters based on the animal. Very few groups of higher rank than species are equivalent, or can be coordinated. I do not propose, on the one hand, to follow

Mr. Clark in out-Linneanizing Linné, and restricting nearly all the British Siphonobranchiata to the single genus *Murex*, nor, on the other hand, to adopt what I consider the excessive multiplication of genera proposed by the Messrs. Adams, Dr. Mörch, and other systematists of the extreme party of progress.

The *Muricidæ*, like the *Buccinidæ*, prey on other mollusca, and eat dead fishes. They frequent every part of the globe.

Genus I. BUCCINOP'SIS*, Jeffreys. Pl. V. f. 3.

SHELL oval, spirally striated: *epidermis* filmy: *spire* short, with a blunt point: *outer lip* smooth within: *pillar* also smooth: *canal* short and open: *operculum* triangular; nucleus placed on the inner base of the mouth.

The principal difference between this genus and *Buccinum* consists in the operculum, the nucleus of which is in *Buccinopsis* terminal, at the inner base of the mouth, the increase taking place by semielliptical layers; while in the other genus it is placed within the edge, at the outer side of the mouth, the increase taking place by concentric layers. The egg-cases of *Buccinopsis* are separate, and shaped like a well-filled leather purse, the opening for the egress of the fry being at the top and very wide. According to Mr. Alder, "its tongue differs from that of *Buccinum undatum*, as well as from those of the allied species of the genus *Fusus*, and makes a slight approach to that of *Mangelia*. It has a single plain and slightly curved tooth on each side, and a very thin non-denticulated plate in the centre."

I am not over fond of repeating the *opsis*-composition in generic names; but the resemblance of the shell which I am about to describe to that of *Buccinum* is very close, and the name *Buccinopsis* is of some years' standing, as well as peculiarly appropriate. Dr. Stimpson lately proposed (without a description) another name, *Liomesus,* for our British species: that name would convey an erroneous impression, if derived from the Greek, as the shell is not smooth in the middle. The *Buccinum deforme* of Reeve (a sinistrorsal shell), from Spitzbergen, appears to belong to the present genus.

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* Having the aspect of *Buccinum*.

BUCCINOPSIS DA'LEI*, James Sowerby.

Buccinum Dalei, J. Sow. Min. Conch. p. 139, pl. 486. f. 1, 2; F. & H. iii. p. 408, pl. cix. f. 1, 2.

BODY pale yellowish-white, with a faint tinge of fleshcolour: *pallial tube* rather long: *head* broadish: *tentacles* short, diverging at an angle of about 25°; tips blunt: *eyes* on short stalks (the extremities of which appear like prominent tubercles) near the outer base of the tentacles; they are very small and black: *foot* large and thick, expanded and rounded, as well as double-edged, in front, minutely tubercled at the sides, and bluntly pointed behind: *verge* falcate, very long and narrow.

SHELL egg-shaped, with a truncated base, moderately solid, semitransparent, somewhat glossy: *sculpture,* numerous very slight and delicate spiral striæ, and still more close-set lines of growth; these marks are only discernible with a magnifying-power, the surface appearing smooth to the naked or unarmed eye: *colour* that of ivory: *epidermis* extremely thin, pale yellowish-white, with a faint tint of brown: *spire* short and terminating rather abruptly; apex compressed and regular: *whorls* 5–6, tumid, rapidly enlarging; the last occupies at least three-fourths of the shell: *suture* wide and slightly excavated, but not very deep: *mouth* forming an obtuse angle on the inner side, and curved outwardly; upper corner contracted and acute-angled; the length of the mouth is more than five-eighths that of the spire: *canal* wide and deep, a little recurved to the left, with a corresponding notch on the outside; its edge is thickened and reflected: *outer lip* semicircular; edge also thickened and reflected: *inner lip* thin, consisting of a porcellanous glaze: *pillar* broad, smooth and polished; microscopically viewed it is curved with pustules, which are arranged in lines lengthwise: *operculum* obliquely triangular, pale yellowish-brown, thin, marked by several faint lines, which diverge from the nucleus upwards; layers of growth numerous and irregular. L. 1·5. B. 1.

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* Named after Dr. Dale, formerly an antiquary at Harwich.

Var. *eburnea.* Shell smaller and thinner, with the spire more produced. *Tritonium eburneum*, Sars, Reise i Lofoten og Finmarken, 1849, p. 73.

Habitat: Co. Cork, in the stomach of the red gurnard and haddock (Humphreys), from which source I have reason to believe Dr. Turton's typical specimen, now in my possession, was derived, instead of from Plymouth as stated by him; west coast of Ireland, 100 f. (Hoskyns, *fide* King); soft ground beyond the Dogger bank, 40–50 f. (King and others); Aberdeenshire (Macgillivray and Dawson). The variety has been dredged by me, on a bottom of fine sand mixed with mud, in 72–87 f., off the northern and eastern coasts of Shetland (with *Fusus Norvegicus* and *F. Berniciensis*), by Sars at different places between the Loffoden Isles and the North Cape, at depths of from 40 to 50 f., and by M'Andrew and Barrett also in Upper Norway, in 100–160 f. The typical form occurs in the Red and Coralline Crag, but is more rare in the latter; Antwerp Crag (Nyst). I noticed a specimen from the last-mentioned deposit in the Royal Museum at Brussels, which measured 3¾ inches in length by 1¾ in breadth. Mr. Searles Wood found a specimen in the Red Crag having the spire reversed. The following localities recorded for this species in a living state require confirmation:—Sea of Okhotsk (Middendorff, as *Tritonium ooïdes*), and Behring's Straits (P. Carpenter).

The animal is slimy, and rather active. Its egg-cases are sometimes deposited on the under side of the maternal shell; the base of their attachment is narrower than the upper portion. The shell is known among the Staithes fishermen as the "white whelk." Its home appears to be the German Ocean and the Nymph bank, instead of the arctic seas. Mr. S. Wood's speculation as to the reason why fossil are more distinctly striated than recent specimens is ingenious. He took for granted that the species is "dying out," and suggested that the faint and imperfect striæ on the shells of the surviving race may be "from failure of vigour in those organs necessary for such distinction, consequent upon the approaching demise of the species." Some of the Crag specimens, however, are not less smooth than recent ones, and were described by Sowerby as his variety "(a), ventricose, rarely sulcated."

It is the *Buccinum ovum* of Turton (not *Tritonium ovum* of Middendorff), and probably *B. crassum* of Nyst; the young was described by Macgillivray as *Halia Flemingiana*.

Genus II. TRITON*, De Montfort. Pl. V. f. 4.

SHELL thick, each whorl strengthened lengthwise by a varicose rib: *epidermis* skin-like: *spire* bluntly pointed: *outer lip* and *pillar* plaited or tuberculated: *canal* rather short, open throughout, and nearly straight: *operculum* oval or oblong; nucleus placed at the outer base of the mouth.

The two fine species which I now give as additions to our mollusca inhabit that part of the sea which washes the extreme southern coast of England. Those who reject *Haliotis* because it has not been found north of Guernsey would of course consider the *Tritones* and a few species of other genera extra-British. With such

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* The name of a mythological sea-god.

I will not dispute, but leave them to their own opinion. If a time should arrive when the Channel Isles cease to be part of this country, all the above items may be omitted, and transferred to another account in the ledger of European fauna.

The name of *Triton* has long been established and in use for a well-known genus of lizards. Link and Cuvier called the shell *Tritonium*, and Schumacher *Lampusia*: the former name, however, was preoccupied by Müller; and, although it has been superseded, some confusion might arise from the new application of it. Should any change be necessary, *Lampusia* may be adopted.

1. Triton nodi′ferus*, Lamarck.

Triton nodiferum, Lam. An. s. V. vii. p. 179.

Body of a vermilion tint, marbled with diffused spots of reddish-brown: *mantle* white [prettily variegated (Costa)]: *tentacles* adorned with two black bands: *foot* having the sole orangecolour. (Philippi.)

Shell conic-oblong, with an angulated outline, very strong and solid, opaque, rather glossy: *sculpture*, a thick rib behind the outer lip on the body-whorl, and one in a corresponding position on each of the other whorls, which form varices and are apparently the marks of annual growth; the whole surface is irregularly covered with numerous spiral ridges and finer intermediate striæ (besides close-set microscopic lines in the same direction), the ridges being more or less tuberculated or nodose: *colour* whitish, with a pale flesh tinge, variegated by coffeecoloured spots, stripes, and blotches: *epidermis* brownish-yellow, thin, and easily peeled off: *spire* elongated: *whorls* 8–10, swollen, and compressed upwards; the last occupies nearly two-thirds of the shell: *suture* rather slight: *mouth* acute-angled at the upper and lower corners; length about one-half that of the spire: *canal* wide and deep, ending outside in a shallow notch; its edge is thick, but not reflected: *outer lip* semicircular, sloping or bevelled inwards, and furnished inside with from 15 to 20 short coffeecoloured ridges which terminate inwards in small tubercles, and outwards in points, giving a scalloped appearance to the outer edge; some of these ridges are double or arranged in pairs: *inner lip* forming a polished glaze, which is thicker on the outside of the canal: *pillar* broad, furrowed across with numerous plaits or narrow ridges, the uppermost of which is the largest, and the lowermost are sometimes broken or interrupted; there is a smooth space between the top plait and the upper corner of the mouth: *operculum* obliquely oblong, horncolour, rather solid; layers of growth slightly imbricated or overlapping one another. L. 6. B. 2·75.

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* Knot-bearing.

HABITAT: Guernsey coast, where three living specimens were trawled at different times between 1825 and 1832. Two were procured by Mr. Lukis (who kindly presented one of them to me), and the third by Sir Thomas Mansell: the largest was taken near the Caskets, by James Ozanne of Paridis Vale, on the 25th of August 1825. Mr. Lukis kept this specimen alive for some time. I was assured both by him and Mr. Gallienne that the Guernsey fishermen trawl only within a short distance from their own land, and never go on the opposite coast of France, and that French trawlers never come to the Channel Isles. Fossil at Piacentino (Brocchi) and Palermo (Calcara, ? Philippi). It inhabits the North Atlantic from Brest (Fréminville, *fide* Collard des Cherres) to the Azores (Drouet), both sides of the Mediterranean (Lamarck and others), the Adriatic (v. Schröckinger), and Archipelago (Linné).

It seems to have the same faculty as the snails and slugs for reproducing amputated parts. Madame Power lopped off a tentacle; and at the end of 20 days a new one had been formed, six lines in length; previously to amputation it measured fourteen lines. According to Philippi, the animal, shortly before death, emits a fluid which he calls "pulcherrime cœlestem." The Sicilian fishermen not only use the shell as a trumpet, but eat the leathery inhabitant and esteem it a delicacy; M'Andrew saw it offered for sale with other shell-fish in the market at Algiers. Vérany tells us that at Nice the shell of *T. nodiferus*, with a hole at the top, serves as a trumpet for the fishermen and countrypeople, and that the braying noise produced by it renders this musical instrument indispensable for the old-fashioned charivari, which he describes as a deafening serenade to signalize the marriages of widows and ill-assorted couples. My specimen is incrusted with several kinds of *Lepralia* not noticed south of the British coasts, *Spirorbis granulatus*, *S. corrugatus*, and *Truncatulina lobatula*.

Murex Tritonis of Linné is a large tropical shell (the true Triton's trumpet), although his description included the present species.

2. T. CUTA'CEUS*, Linné.

Murex cutaceus, Linn. S. N. p. 1217.

BODY on the upper part painted with irregular spots of dark purple, which are separated by narrow white lines: *foot* pale violet above, marbled on the sides, and speckled here and there with reddish spots which are edged with white. (Philippi.)

SHELL conic-oval, with a twisted and angulated outline, very strong and solid, opaque, rather glossy: *sculpture*, a thick and expanded rib behind the outer lip, a prominent and somewhat crested rib on the middle of the body-whorl, another on the penultimate whorl, and frequently a fourth on the preceding whorl (all but the labial rib being varicose); there are also broad flattened spiral ridges (from 6 to 10 on the body-whorl), besides a few irregular thread-like striæ in the interstices; the penultimate whorl has 3 or 4 ridges, and each of the next two whorls has 2 ridges; the ridges on the upper part of the shell are more or less tuberculated or nodose; the whole surface is covered with fine and close-set longitudinal striæ, which produce an imperfect cancellation: *colour* yellowish-white, tinged or obscurely streaked with purplish-brown: *epidermis* brownish-yellow, moulded on the longitudinal sculpture, more adhesive or persistent than in the last species: *spire* turreted, short; apex depressed, and smooth, consisting of an incomplete turn: *whorls* 5–6, convex, strongly angulated by the varices, and compressed upwards; the last occupies three-fourths of the shell: *suture* deep, interrupted by the varices: *mouth* narrow, acute-angled above and below, contracted at the upper corner by a tooth on each side, so as to leave an excavation like the top of a key-hole; length, exclusive of the canal, about two-fifths that of the whole spire: *canal* narrow and contracted, ending outside in a rather deep and oblique notch with a thick edge: *outer lip* nearly semicircular; that part which consists of the last-formed rib is flat, thick, and strengthened by a continuation of the spiral ridges; the inside of the lip is furnished with 7 or 8 strong tuberculated plaits, the spaces between which, where the lip is inflected, are deeply excavated: *inner lip* broad and rather thick, united above with the outer lip, reflected over the lower part of the pillar, behind which there is a shallow groove terminating in a small umbilical hole, caused by the superposition of the new mouth on that of the preceding whorl: *pillar* broad, shelving inwards, curved above, and sloping below to the left; close to the upper corner of the mouth is a tooth or short tubercular plait, and frequently another minute tooth just below it; at some distance within may also be detected four or five ridge-like plaits; the lower part of the pillar is indistinctly corrugated or wrinkled across: *operculum* obliquely oval, yellowish-brown or horncolour, rather solid; layers of growth numerous. L. 2·4. B. 1·7.

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* Covered with a skin or epidermis.

Habitat: Guernsey, dredged by Dr. Lukis and Mr. Barlee; from a crab-pot (Macculloch); taken by Mr. John Rougier on a large flat stone at the extreme verge of the lowest spring tide, while gathering ormers (*Haliotis tuberculata*) in the island of Lihou (Dr. Lukis): dead shells have also been found by Mr. Lukis and others on the beaches at Guernsey and Herm. Forty years ago Dr. Turton recorded the capture of this species at Padstow, and afterwards at Falmouth and Guernsey; but the Cornish localities have not been verified by any subsequent discovery. For my specimens I am indebted to the liberality of Dr. Lukis and Mr. Macculloch; I likewise have one in the Turtonian collection. *T. cutaceus* is not uncommon on the coasts of the north, west, and south of France, and those of Spain, Portugal, Italy, Algiers, and the Canary Isles.

Young shells resemble stunted specimens of *Murex erinaceus*.

No habitat is given by Linné for his *Murex cutaceus*; his description and reference to Seba's figure may apply to some tropical species of *Triton*. I should have preferred considering the present species his *M. pileare*, which he says is Mediterranean. Our shell is the type of De Montfort's genus *Aquillus*.

The obliging attention of the Rev. Dr. Robinson has enabled me to examine and compare the unique specimen of *T. elegans*, Thompson (Ann. & Mag. N. H. xv. p. 317, pl. xix. f. 1), stated to have been found by the late Dr. Farran alive at Portmarnock in Dublin Bay, and now in the public museum at Armagh. It is the *Hindsia angusticostata* of Pease, a common shell of the Sandwich Islands. Portmarnock has been from the time of Turton a prolific source of such erroneous additions to the catalogue of British shells.

Genus III. MUREX*, Linné. Pl. V. f. 5.

Shell more or less turreted, ribbed lengthwise and ridged spirally, so as to form an imbricated kind of sculpture, often with prickly points; the body-whorl has more than one varix: *spire* prominent and sharp-pointed; apex mammiform: *outer lip* plaited or tuberculated within: *pillar* smooth: *canal* rather long, narrow, covered over, turning obliquely to the left: *operculum* oval; nucleus placed at the lower side of the outer lip.

The name of this genus (as well as πορφύρα, *purpura*, and *ostrum*) was in familiar use among the ancients, and signified not only the Tyrian dye but also the shell-fish (*M. trunculus*) which produced it. It is related by Isidorus that the dye results from the purple tears shed by the *murex* when wounded. Aldrovandi collected an immense number of poetical quotations having reference to this highly prized colour, which was for so many ages the emblem of rank and distinction. Sumptuary laws were then very strict: indeed two centuries have not elapsed since they were in force in England and much commended by our great philosopher, Bacon. The deposit of the spawn and production of the young *murices* were described by Aristotle with his usual accuracy; and yet he persisted in asserting that all testaceous mollusca were generated from putrefying matter and slime. The shells of this genus are remarkable for their elegant sculpture; some are ornamented by elaborately carved leaf-like varices, others by a series of flounced ribs, a few by rows of long almost tubular spines; occasionally the aperture is profusely enamelled, and tinged with roseate hues. The temperate zone, however, cannot boast of such beauty. It was supposed by the late Mr. G. B. Sowerby that, when the outer lip of a *Murex* is fringed with spines, the animal can remove these processes by some means, probably a solvent liquor, to enable it to enlarge its shell. But his own admirable figures are opposed to the conjecture, and show that the spines are persistent.

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* The name given by Pliny to a kind of shell-fish.

1. MUREX ERINA'CEUS*, Linné.

M. erinaceus, Linn. S. N. p. 1216; F. & H. iii. p. 370, pl. cii. f. 4, and (animal) pl. TT. f. 1.

BODY yellowish of different shades, mottled or lineated with flake-white: *pallial tube* short: [*proboscis* 8–10 lines long (Bouchard-Chantereaux):] *tentacles* sometimes saffroncolour, slender, and tapering to a fine point; they are nearly close together at the base, and diverge at a right angle: *eyes* on long stalks, which are united with the tentacles outside and extend two-thirds of their length from the base: *foot* rather small and narrow, rounded and double-edged in front with short angular corners, bluntly pointed behind; sole slightly grooved down the middle: [*gills* very small, brownish (Bouchard-Chantereaux):] *odontophore* cylindrical, rather long [central tooth convex, keeled, projecting in the middle in front, the angles extended behind, base curved and prominent, cutting-edge finely notched in a groove-like manner on each side, and having 3 crested points, the middle of which is larger and expanded, grooved on the inner side; lateral teeth having a long claw-like hook (Lovén)].

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* A hedgehog; from its prickly surface.

Shell conical, rugged, solid, opaque, of a rather dull hue: *sculpture*, strong buttress-like longitudinal ribs, of which there are 7 or 8 on the body-whorl, 8 or 9 on the next, and one more (in a progressive ratio) on each of the preceding whorls; some of these ribs are varicose; but there seems to be no regularity in this respect, as the number probably depends on the quick or slow growth of the individual; there are also several cord-like spiral ridges on all the whorls (except those which form the apex), alternating in size, two on each of the upper whorls being more prominent; the surface is also covered with small and close-set wavy plait-like striæ, which are arranged in transverse rows of short vaulted scales on the lower whorls, and give an imbricated or flounce-like aspect; the upper whorls are coarsely cancellated: *colour* yellowish-white, sometimes mottled or streaked with reddish- or purplish-brown, and the upper part of each whorl is now and then encircled by a white or pale band: *spire* turreted, rather short; apex somewhat cylindrical, smooth and glossy, obliquely twisted upwards: *whorls* 8–10, convex, but angulated, more or less flattened at the top; the last occupies three-fourths of the shell: *suture* wide and deep, partly interrupted by the ribs: *mouth* regularly oval, with the upper corner curved; it is proportionally larger and somewhat expanded in half-grown specimens; length (exclusive of the canal) between one-third and one-fourth that of the shell: *canal* open throughout in the young, and in after growth becoming tubular except at the base, in consequence of the overlapping on each side of the outer and pillar lips, which are ultimately welded together; it is obliquely truncated towards the base, and terminates outside in a deep and rounded notch with a thick edge: *outer lip* nearly semicircular; that part which consists of the last-formed rib slopes outwards, and is strengthened by a continuation of the spiral ridges; the edge is slightly prominent; inside fluted, and furnished with 7 or 8 small tubercles or teeth: *inner lip* thick, united above with the outer lip; at the base of the pillar is a groove and umbilical chink, as in *Triton cutaceus*, but it is much smaller and less distinct: *pillar* broad and glossy: *operculum* reddish-horncolour, thinner than in the last-mentioned species, irregularly laminated, and microscopically and superficially wrinkled. L. 2·25. B. 1·125.

Var. *sculpta*. Spiral ridges much more prominent and keel-like, especially those on the upper part of each whorl, giving the shell a scalariform appearance; space below the suture deeply excavated.

HABITAT: Stony ground, at low-water mark and in the laminarian and coralline zones, on the southern and western coasts of England and Scotland, and throughout Ireland and Wales; estuary of the Thames (Thomas and J. G. J.); trawled off Yarmouth (Rose); Scarborough (Bean); Northumberland and Durham (Alder); dredged in Berwick Bay, 50 f. (Mennell); Moray Firth (Gordon); Aberdeen (Macgillivray). All the specimens procured from the northern coasts were dead. I dredged the variety off Guernsey. *M. erinaceus* occurs in quaternary deposits at Strethill (Maw); Macclesfield (Darbishire); Kelsey Hill (Prestwich); Moel Tryfaen (Darbishire and Drury Lowe); Belfast (Grainger); Ireland and Clyde beds (J. Smith and Forbes); "Mammalian Crag" at Bramerton (S. Wood); "Norwich Crag" (Witham, *fide* Woodward); Italian tertiaries (Brocchi, Scacchi, and Philippi). Living in the Cattegat (Lovén); North Atlantic from Boulogne (Bouchard) to Madeira (M'Andrew) and the Azores (Drouet); Mediterranean (Linné and others); Black Sea (Middendorff). Bathymetrical range, shore to 30 f.

The animal yields a purple dye, like that of *Purpura lapillus*, but not in such quantity; the tint is violet, and is said to become more vinous, more blue, or more rosy under apparently the same conditions. It is the "sting-winkle" of our fishermen, who do their best to get rid of it on account of the ravages which it commits in oyster-beds. This destructive habit has been well described by Dr. Fischer in the 'Journal de Conchyliologie' for January 1865. He says that at Arcachon *M. erinaceus* goes by the name of "cormaillot" or "perceur," and preys on the young oyster (from 6 to 8 months old), drilling the shell between the muscular impression and the beak, generally in the concave and larger valve. The shells of old oysters are too hard for the *Murex* to penetrate. The drilling-operation takes 3 or 4 hours. When a hole is made, the whelk uncurls and inserts its long proboscis, and leisurely devours its victim. MM. Petit, Cailliaud, and Taslé have also noticed the damage done by this noxious mollusk on other parts of the French coast. Man is not the only animal that relishes an oyster. M. Cailliaud attributes the perforating power of the *Murex* to its "trompe acidulée;" the spinous tongue, however, is usually considered the agent. The egg-cases are separate, of a triangular shape, and compressed at the sides, with a small round hole at the top for the egress of the fry; the stalk is short and narrow. They are deposited indiscriminately on shells and stones, and form a cluster of from 15 to 150, each containing from 12 to 20 perfect whelklings. I caught a small *M. erinaceus* feeding on an *Anomia*, and found that the perforation in the shell of the latter was one-sixth of an inch in diameter, being greater than that of the proboscis at its point; it therefore seems that the hole had been enlarged after it was made. Some specimens of *M. erinaceus* are very much larger than others, even in the same locality; in the Mediterranean they attain a comparatively gigantic size.

The "urchin-shell" of Pennant, *Buccinum porcatum* of Da Costa, and perhaps *M. cinguliferus* of Lamarck, when half-grown it is the *M. Tarentinus* of the last-named author. *M. decussatus* of Gmelin (from Adanson) is closely allied, if not identical. *M. torosus* of Lamarck is, according to the Rev. R. T. Lowe, a variety, probably *sculpta*; but most conchologists refer to that species a tropical shell with smooth ridges. Leach called the present species *Ocinebra erinacea.* What right have naturalists to play such pranks,

> "And nickname God's creatures"

in this fashion?

2. M. ACICULA'TUS*, Lamarck.

M. aciculatus, Lam. An. s. V. vii. p. 176. no. 66. *M. corallinus*, F. & H. iii. p. 374, pl. cii. f. 5, 6.

Body bright coral-red or scarlet [vermilion (Philippi)], occasionally speckled with yellowish-white or golden-yellow: *mantle* thick, lining the mouth of the shell: *pallial tube* rather long: *head* small: *tentacles* extensile, of a paler colour than the rest of the body, microscopically ciliated, especially at the tips, which are bluntly pointed: *eyes* small, placed on stalks which are amalgamated with the tentacles at their outer bases and extend between one-third and more than halfway up: *foot* rather slender, rounded or truncated and double-edged in front, contracted and narrower in the middle, and bluntly pointed behind; sole having a clear edge or margin.

Shell oblong, approaching to spindle-shaped, solid, opaque, lustreless: *sculpture*, strong, broad, and rounded, but not very prominent longitudinal ribs (8 to 10 on the last whorl, and one more on the penultimate), some of which are occasionally varicose, as in *M. erinaceus*; all the whorls except the uppermost are encircled by thread-like ridges, of which there are about 20 on the body-whorl, 7 or 8 on the sixth, 5 or 6 on the fifth, 3 on each of the fourth and third, and 2 on the preceding whorl, the whorl and a half which constitute the apex being smooth and glossy; many of these ridges on the body-whorl alternate in size, and some of those below the periphery are often larger and coarser than the rest; the surface is also covered lengthwise with numerous and close-set twilled striæ, which form transverse rows of short vaulted scales on the crests of the ridges upon the lower whorls, the ridges upon the upper whorls being tuberculated: *colour* dark reddish-brown: *spire* produced; apex somewhat cylindrical, with a globular extremity, which is obliquely twisted on one side: *whorls* 7–8, convex, but compressed upwards; the last occupies two-thirds of the shell: *suture* wide, not deep, more or less interrupted by the ribs: *mouth* exactly oval, expanding outwards; length (exclusive of the canal) five-twelfths of the shell: *canal* short, turning to the left, covered over on the lower part by the interjunction of the two lips, and terminating in an oval fistulous orifice: *outer lip* nearly semicircular, sharp and thin, slightly scalloped by the spiral ridges, and sloping inwards to the throat, which is furnished with 6 or 7 small white tooth-like tubercles: *inner lip* detached at its edges, and reflected on the pillar and canal; it is continuous with the outer lip at the upper corner of the mouth; behind it on the lower part is a narrow depression or groove, which separates the new from the old canal, the base being twisted: *pillar* broad and glossy: *operculum* reddish-horncolour, rather thin, irregularly laminated, and microscopically fretted; muscular impressions on the underside elliptical, and nearly central. L. 0·5. B. 0·25.

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* Rather finely pointed.

Var. *badia*. Baycolour.

HABITAT: Channel Isles, on stony and rocky ground at low-water mark and in the laminarian and coralline zones. I obtained the variety by dredging in 22 f. off St. Martin's Point, Guernsey. Scacchi and Philippi have recorded this species from the Italian tertiaries, and Woodward from the Coralline Crag at Gedgrave. Its existing distribution comprises the North Atlantic from Brittany to the Canary Isles and the Azores, the Mediterranean, and the Adriatic; depths 4–40 f.

M. Martin showed me the spawn-cells, attached to the underside of the shell. I have dredged similar capsules at Guernsey. These are solitary, barrel-shaped and strongly corrugated; the ova are elliptical and prismatic. Specimens of *M. aciculatus* from the coralline zone are not unfrequently covered with a sponge, or now and then with one of the minute tubular Hydrozoa, which gives the shell the appearance of having a hairy epidermis.

Lamarck's descriptions are usually too concise or too vague to identify species; but in the present case no doubt can arise, and I must retain the name imposed by him, in preference to the later one (*corallinus*) of Scacchi. Lamarck received this species from the coast of Brittany, where it is not uncommon; and it is enumerated in the list of Collard des Cherres under the name of *M. aciculatus*. Philippi placed it in the genus *Fusus*, and referred it to the *F. lavatus* of Basterot. Sowerby and Reeve called it *M. inconspicuus*.

Genus IV. LA'CHESIS*, Risso. Pl. VI. f. 1.

Shell having the shape of a short spindle, strong, ridged spirally, and ribbed lengthwise but not varicosely: *spire* produced; apex mammiform: *outer lip* notched within: *pillar* smooth: *canal* short, wide, nearly straight, open throughout: *operculum* oval, bluntly pointed at the base; nucleus placed at the lower side of the outer lip.

The species are few and of small size; they inhabit the littoral and laminarian zones. Risso appears to have ingeniously constructed another genus (*Nesæa*) out of the same type.

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* One of the Fates.

LACHESIS MI'NIMA*, Montagu.

Buccinum minimum, Mont. Test. Br. (i.) p. 247, t. 8. f. 2. *L. minima*, F. & H. iii. p. 377, pl. ci. f. 7, 8.

BODY yellowish, speckled with flake-white: *pallial tube* long and cylindrical: *tentacles* extensile (short and club-shaped when the animal is at rest), diverging from their base at an acute angle, compressed in front and behind: *eyes* small, on the extremity of stalks which extend about halfway up the tentacles: *foot* comparatively long and slender, although shorter than the shell, squarish and double-edged in front with small angular corners, becoming narrower behind, and ending in a bluntly pointed tail.

SHELL oblong, solid, opaque, and rather glossy: *sculpture*, a broad rib or callus behind the outer lip, and narrower longitudinal ribs on all the whorls except the first; these ribs seldom, however, cover the last half of the body-whorl; when they do so, 9 may be counted on that whorl, and 10 on the next; they are crossed by broad and flattened spiral ridges, which are defined by impressed lines or striæ (15–20 on the body-whorl, and 4 on each of the preceding four whorls, the first or apical whorl being closely and microscopically striated in the same direction); the ribs consequently become more or less nodulous or tuberculated; marks of growth close-set: *colour* that of coffee or reddish-brown, varying in intensity: *spire* abruptly pointed; apex globular, twisted on one side: *whorls* 5–6, rather convex, compressed upwards; the last occupies four-sevenths of the shell: *suture* distinct, but not deep: *mouth* oval, somewhat expanding outwards; length (exclusive of the canal) two-fifths of the shell: *canal* bending a little to the left, terminating at the base in a deep rounded notch with a thick edge: *outer lip* curved, slightly inflected on the periphery, plain-edged; throat furnished with half a dozen tooth-like ridges or plaits, the largest of which is close to the canal: *inner lip* rather thin and narrow, spread over the pillar and side of the canal, indistinctly united with the outer lip; there is no trace of an umbilical chink, the base being even and rounded: *pillar* obtusely angulated at the entrance of the canal: *operculum* yellowish, closely and finely striated in the line of growth. L. 0·2. B. 0·1.

Var. *pallescens*. Of a paler colour, and occasionally milk-white.

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* The smallest (viz. of the *Buccina*).

Habitat: Rocky and stony ground at low-water mark, and in the laminarian zone, on the coasts of Cornwall, Dorset, Devon, and the Channel Isles; common, but local. The following recorded notices are by no means reliable or prove that *L. brunnea* is indigenous to these places:—Langland Bay, near Swansea (Dillwyn); St. Cyrus, Kincardineshire (Brown); Tynemouth and Cullercoats (Alder). With regard to the last two localities Mr. Alder tells us that this species has never been found there alive, and that "the sand of the coast is rather vitiated with ballast from the ships." I found the variety at Guernsey. *L. brunnea* is fossil at Pezzo in Calabria (Philippi); ? Ireland (J. Smith). It inhabits the Atlantic shores of France, Spain, Portugal, and Madeira, the Mediterranean, and Adriatic; depths, shore –35 f.

This has a different habit from most other whelks, viz. swimming with its foot upwards. It does not seem to require the use of the top whorls, the spire being sometimes truncated in living and vigorous specimens.

Donovan, simultaneously with Montagu, described the present shell as *Buccinum brunneum*; this specific name is not Ciceronian, but appropriate, and better than *minima*, which gives a wrong standard of comparison. However, the latter name is sanctioned by Philippi having also used it, without being aware of Montagu's publication; he afterwards noticed the curious coincidence. The *Buccinum minimum* of Turton, in his translation of the 'Systema Naturæ,' is *Nassa incrassata*. It is the *L. mamillata* of Risso (and apparently also his *Nesæa mamillata*), *Murex Massenæ* of Delle Chiaje, according to Philippi *Fusus turritellatus* of Deshayes, *Buccinum rubrum* of Potiez and Michaud, and *Fusus subnigris* of Brown.

Murex gyrinus of Montagu (not of Linné), a base coin from the Laskeyan mint, is exotic; Turton's specimen shows it to be a *Lachesis*.

Genus V. TROPHON*, ? De Montfort. Pl. VI. f. 2.

Shell spindle-shaped, never umbilicate, lengthwise plaited or having laminar (occasionally varicose) ribs, and sometimes cancellated by spiral ridges: *epidermis* none: *spire* elongated: apex mammiform: *outer lip* seldom notched or toothed within: *pillar* smooth, more or less twisted: *canal* usually long and beak-like, open throughout: *operculum* pear-shaped, flexuous: nucleus placed at the inner base of the mouth: *egg-cases* separate, membranous, hemispherical, and attached by the circular base.

De Montfort has the credit of instituting this genus; but his definition does not correspond with our idea of it. He describes the shell as globular, with an expanded mouth, the outer lip foliated or plaited, the base umbilicate, and the canal short; indeed he lays great stress on its having a very deep and conspicuous umbilicus, as distinguishing *Trophon* from *Buccinum*. The genus, as now recognized, possesses scarcely one of the characters attributed to it by the founder. The name, however, is immaterial. Whether *Trophon* is distinct from *Fusus*, or is merely

. . . . . "et nomen et genus inutile,"

are other questions that require much consideration. I adopt the genus provisionally.

Trophon frequents the laminarian and coralline zones, and appears to be restricted to the North Atlantic.

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* Contracted from Trephonius, the name of a mythological deity.

1. TROPHON MURICA'TUS, Montagu.

Murex muricatus, Mont. Test. Br. (i.) p. 262, t. 9. f. 2. *T. muricatus*, F. & H. iii. p. 439, pl. cxi. f. 3, 4, and (animal) pl. 88. f. 5, as *T. echinatum*.

BODY whitish: *pallial tube* short [often extending beyond the canal of the shell (Clark)]: *head* inconspicuous: *tentacles* rather long and tapering to a point; two-thirds of each on the lower side are more than twice the thickness of the upper portion, owing not only to the addition of the eye-stalk, but to the tentacle itself being broader at the base: *eyes* small and black: *foot* rather long and expansile, squarish in front with a gently curved outline, somewhat angulated at the corners, and bluntly pointed behind; sole slightly grooved: *verge* large, sickle-shaped.

SHELL slender, not very solid, nearly opaque, and having scarcely any gloss: *sculpture*, numerous longitudinal ribs, which (especially on the body-whorl) are often laminar, and more or less varicose; these ribs usually do not extend to the infrasutural part of each whorl; there are also thread-like spiral ridges, about 12 on the body-whorl, 4 or 5 on the next, and gradually lessening in number towards the apex, which is microscopically and closely striated in the same direction; the points of intersection between the longitudinal and spiral sculpture on the crests of the ribs are tubercular, or corrugated, sometimes prickly like the vaulted scales on the ribs of many species of *Pecten*; the lines of growth are minute and irregular: *colour* yellowish-white, or fleshcolour tinged with reddish-brown: *spire* extending to an abrupt point; apex globular, twisted either on one side or downwards: *whorls* 7–8, convex and rather tumid, angulated and flattened on the upper part, so as to give a turreted aspect to the spire; the last occupies nine-fourteenths of the shell: *suture* wide and deep: *mouth* proportionally small, triangularly oval, expanding outwards; length two-sevenths of the shell: *canal* semitubular, inclining a little to the left, and terminating in a deep and obliquely rounded notch; externally it is devoid of any sculpture except the marks of growth: *outer lip* prominent, contracted above, and abruptly incurved under the periphery; edge thin, scalloped by the spiral ridges; inside, or throat, finely plicated or furrowed: *inner lip* reflected over the pillar and canal, continuous with the outer lip: *pillar* curved, broad, and flattened, sloping inwards to a sharp cutting edge: *operculum* yellowish (horncolour in darker specimens), obliquely and irregularly striated in the line of growth. L. 0·625. B. 0·25.

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* Muricated or prickly.

Var. *lactea*. Milk-white.

Habitat: Muddy sand in the coralline zone of Devon, Cornwall, and Guernsey; Tenby (Lyons); Fishguard (J. G. J.); Isle of Man (Forbes); Dublin Bay (Turton and others); Cork (Humphreys); Arran Isle, co. Galway (Barlee): not uncommon. Other localities have been published; but I believe *T. Barvicensis* was in these cases mistaken for the present species. One is off the Mull of Galloway, in 145 f. (Beechey). The variety occurs on the coasts of Devon and Guernsey, particularly in 'Hurd's Deep,' a submarine trough near the latter island, in about 60 f. Red and Coralline Crag (Wood); ? co. Wexford (Forbes). The *T. muricatus* of Nyst, from the Belgian tertiaries, is a different species. Living on the Atlantic coasts of France, Spain, Portugal, the Mediterranean, and Ægean; depths 8–150 f. Dr. Gould enumerated it among the shells of Massachusetts, on what he admitted was unsatisfactory authority; the lamented death of that excellent zoologist may, I fear, preclude the appearance of the expected new edition of his 'Report,' which would have doubtless cleared up the point.

The capsules are about a line in diameter, and have an oval orifice; they contain a purplish liquor, together with the fry. The shell is often incrusted with a fine reddish sponge, regarded by Montagu as an epidermis, My largest specimen is more than four-fifths of an inch long. After the spire has been accidentally truncated, the rest of the shell is sufficient for the animal.

Philippi described it as the *Fusus echinatus* of J.

Sowerby, and referred to it the *Murex variabilis* of Cristofori and Jan. The type of Leach's *Fusus asperrimus,* in the British Museum, is a specimen of the white variety of *T. muricatus,* having the ribs more prickly than usual.

2. T. Barvicensis*, Johnston.

Murex Barvicensis, Johnst. in Edinb. Phil. Journ. xiii. p. 225. *T. Barvicensis*, F. & H. iii. p. 442, pl. cxi. f. 5, 6, and (animal) pl. SS. f. 4, as *T. Barvicense*.

Body white, and microscopically veined or speckled with chalk-white flakes: *mantle* thick: *pallial tube* very short: *tentacles* cylindrical, rather short, widely diverging, with blunt tips; the upper third part is more slender, and the lower part twice as thick; they are flattened, as well as narrower, above the eye-stalks: *eyes* small and black, placed outside the tentacles, about two-thirds of the way up, at the top of stalks, which are amalgamated with the tentacles and appear to form part of them: *foot* extensile, double-edged and nearly square in front, becoming narrower behind, and ending in a rounded or bluntly pointed tail; the front corners are slightly auricled or angular.

Shell resembling the last species in many respects; but this is broader, more delicate and glossy; the longitudinal ribs are much fewer (about two-thirds of the number), more laminar, prominent, and flounce-like; they extend to the suture; the spiral ridges are numerically in the same proportion as the ribs; the top of each whorl is encircled by an elegant coronet of spines: *colour* pure white: *spire* distinctly scalariform or turreted: *mouth* more triangular, and narrower: *canal* rather straighter: *outer lip* sometimes upturned at the upper corner of the mouth, which ends in a sharp point: *pillar* straighter: *operculum* of a paler colour, thinner, and smoother. L. 0·65. B. 0·25.

Habitat: Stony ground in the laminarian, coralline, and deep-water zones, on the coasts of Yorkshire, Northumberland, Durham, Berwick, Aberdeenshire, the west of Scotland, the Orkneys, and Shetland; Cork, with *T. muricatus* (Humphreys); Dublin Bay (Kinahan and Walpole); Lough Strangford, 12–15 f. (Dickie); co. Antrim, 8–25 f. (Hyndman and J. G. J.); perhaps also Dunbar (Laskey, as *Murex muricatus*). "Irish Drift" (Forbes). All the foreign localities are Scandinavian, viz. from Öxfjord in Finmark (Sars and Danielssen) to Bohuslän (Lovén and Malm), at depths of 40–150 f.

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* From the ancient name of Berwick-on-Tweed.

It creeps, like *Lachesis*, foot upwards, on the surface of the water. A capsule, in a valve of *Leda minuta* (now before me), is very thin, semitransparent, and marked with delicate, close-set, microscopic concentric lines; orifice oval. Some shells are more elongated than others. The outer point of the old canal is occasionally visible, so as to make the base double, or (when neither of the two previous canals has been covered with new shelly matter and incorporated with the base) triple. Specimens from beyond the Dogger bank, in 50–60 f., are of unusual size, being nine-tenths of an inch in length.

I consider this species not less distinct from *T. muricatus* than the following species from *T. clathratus*; they bear the same analogy to each other.

3. T. TRUNCA'TUS*, Ström.

Buccinum (*truncatum*), Ström in Norsk. Vid. Selsk. Skr. iv. p. 369, t. xvi. f. 26. *T. clathratus*, F. & H. (not *Murex clathratus*, Linné) iii. p. 436, pl. cxi. f. 1, 2, and (animal) pl. SS. f. 3, as *T. Bamffium*.

Body whitish, pale yellowish-white, or creamcolour, with sometimes a faint tinge of fleshcolour, and thickly covered with milk-white specks: *pallial tube* very short, scarcely protruded: *tentacles* awl-shaped, rather short, and diverging, with blunt tips; that part which surmounts the eye-stalk is slender: *eyes* small, placed on long and thick stalks which reach about two-thirds up the tentacles, on their outside: *foot* narrow, double-edged and bilobed or nearly truncated in front, with small angular corners, rounded or bluntly pointed behind.

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* Cut off.

Shell conic-oval, rather solid, nearly opaque, somewhat glossy: *sculpture*, numerous laminar longitudinal ribs (about 20 on the body-whorl, and 25 on the penultimate), which are folded or incline towards the mouth; they extend to the suture, but not to the base or the canal; the surface of all the whorls except the upper two is covered with minute and slight, close-set, spiral impressed lines or striæ, which do not cause any decussation or make the ribs tubercular; top whorls smooth and of a polished lustre; the lines of growth are irregular: *colour* yellowish-white or pale fleshcolour: *spire* rather short, ending in an abrupt and somewhat truncated point; apex angular, twisted at first obliquely upwards, and then inwards: *whorls* 6–7, convex and rather tumid, the last occupying two-thirds of the shell: *suture* wide and deep: *mouth* oval (with a triangular outline, when the outer lip is flattened on the upper part), expanding outwards; length (exclusive of the canal) a little more than one-third of the shell: *canal* shorter than in either of the foregoing species of *Trophon*, slightly recurved to the left, and terminating in an obliquely rounded notch; externally it exhibits only the marks of growth: *outer lip* curved, sometimes flattened above and abruptly inflected on the periphery; edge sharp, somewhat reflected in adult specimens; inside smooth: *inner lip* slight and inconspicuous, coating the pillar and upper part of the canal, not continuous with the outer lip: *pillar* curved, broad, and somewhat flattened: *operculum* thin, yellowish, irregularly puckered by the oblique lines of growth. L. 0·6. B. 0·275.

Var. 1. *alba*. White.

Var. 2. *scalaris*. Ribs deeper, abruptly truncated and crested at the top of each whorl.

Habitat: Hard ground in the laminarian and coralline zones, from 2 to 50 f., on the eastern and northern coasts of England, all Scotland, Shetland, and the southern and eastern parts of Ireland; Isle of Man (Forbes); Goodwick, near Fishguard, 18 f. (J. G. J.); Tenby (Lyons); off the Mull of Galloway, 110–140 f. (Beechey). Both the varieties are Zetlandic. It is less common than *T. clathratus* as a post-glacial fossil, but is generally diffused; they occur in the same deposits, and also in the Norwich Crag (Woodward), and Red Crag (S. Wood). The existing distribution of the present species is arctic and boreal, extending from Greenland (Möller) to Bohuslän (Lovén and Malm) in the eastern hemisphere, and from Canada (D'Urban) to Massachusetts Bay (Gould and Stimpson) in the western hemisphere; depths recorded 35–120 f.

The 2nd variety of this species corresponds with the variety *Gunneri* of *T. clathratus.* For my largest specimen of the present species I am indebted to Mr. Rose, who procured it by trawling off Yarmouth; it is nine-tenths of an inch in length, and has the usual number of ribs. *T. clathratus* of the same size has only 14 ribs on the body-whorl; it is a thinner and more tumid shell, and attains far greater dimensions than our species. *T. clathratus* is a characteristic fossil of all glacial and post-glacial beds here and abroad; in a recent or living state it inhabits Spitzbergen (the extreme limit of the European fauna), Iceland, Norway, and the Faroe Isles, the coasts of Northern Asia southwards to Japan (A. Adams), as well as Greenland, the eastern and western coasts of North America (Fabricius, Gould, P. Carpenter, and others), from the shore to 100 f. According to Olafsen and Povelsen it was called by the Icelanders "St. Peders-snekke," or St. Peter's snail; the tradition or superstition in which this name originated seems to have been lost. Mohr gave a somewhat similar vernacular name ("Peturs-kongr," or King Peter) for *Fusus Islandicus.*

Both species of *Trophon* have several synonyms; but those best known are *Murex Bamffius* of Montagu for *T. truncatus,* and *Fusus scalariformis* of Gould for *T. clathratus.* *Murex Bamffius* of Donovan includes the two species; his figured type is *T. clathratus,* and what he considered the young is *T. truncatus.* The *Fusus scalariformis* of Nyst, from the Belgian tertiaries, is different from that of Gould.

Another arctic species, found by Sir Henry James in the Wexford postglacial deposit, is *T. craticulatus* of Fabricius (not of Linné); it is the *Fusus Fabricii* (Beck) of Möller, and *Murex borealis* of Reeve. This inhabits Greenland and the White Sea.

A specimen of *T. Syracusanus* was picked up by Dr. Lloyd of Malahide on the sands at Portmarnock in Dublin Bay; it is a rather common Mediterranean shell. Owing to some mistake this specimen is noticed in the 'History of British Mollusca' (vol. iii. p. 440, footnote) as the *Murex rostratus* of Olivi, and as having been found by Mrs. R. Smith at Tenby: possibly the *Fusus decussatus* of Brown (said to have been discovered by him at Killough, co. Down) may be the plain-coloured variety of the first-named species.

Genus VI. FUSUS*, Bruguière. Pl. VI. f. 3.

Shell spindle-shaped, never umbilicate, spirally striated, and sometimes also ribbed, although not varicosely: *epidermis* membranous, occasionally pilose or hispid: *spire* long and tapering; apex usually mammiform, but in certain species symmetrical: *mouth* nearly always plain-edged and having a smooth throat and pillar: *canal* and *operculum* as in *Trophon.*

Although it is very difficult to distinguish this genus from *Trophon,* its operculum is constructed on a different plan from that of the *Buccinum* family. Their habitat also must be taken into account. *Purpura* and for the most part *Buccinum* are littoral; this never lives above low-water mark, and its bathymetrical range probably extends to the yet "unsounded deeps." The egg-cases of *Fusus* are membranous, double-sheathed, semioval or hemispherical, and attached by their base: in *F. antiquus* they are agglomerated (as in *Buccinum undatum*); but in the other British species they are separate, and resemble those of *Trophon.* The tongue is enclosed in a sheath of muscular fibre. According to Lovén the odontophore of *F. antiquus* agrees with that of *B. undatum,* and differs from *F. gracilis* and *F. Berniciensis* in having the central tooth broader across, with the front margin extended on each side in a truncated form; while in the last two species it is squarish. Judging, however, from drawings, kindly furnished by my friend Mr. Alder, of this apparatus in seven of our native species, the plan of construction varies considerably in all but *F. Islandicus, F. gracilis,* and *F. propinquus,* the odontophores of which are similar.

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* A spindle.

Klein was the original author of the name *Fusus*; but he applied it to a large group which he called a genus, each of his species containing several modern genera. Bruguière's definition was likewise too extensive; and Lamarck restricted this genus to nearly its present limits. The species are apparently peculiar to the northern hemisphere.

A. Sculptured only by slight spiral ridges or striæ.

1. Fusus antiquus*, Linné.

Murex antiquus, Linn. S. N. p. 1222. *F. antiquus,* F. & H. iii. p. 423, pl. civ. f. 1, 2.

Body whitish or yellowish-white, with a faint tinge of fleshcolour, sometimes partially speckled with black: *pallial*

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* Of great antiquity, regarding it as also fossil.

tube short but broad, upturned, streaked across with purplish-brown, or speckled like other parts of the body: *tentacles* triangular and flattened, very short, widely diverging, spread out at the base: *eyes* small, on broad lobes which surmount the stalks, and placed near the outer base of the tentacles: *foot* oblong, squarish, and double-edged in front, with short angular corners, expanding at the sides, and bluntly pointed behind; sole often strawcolour or light orange: *odontophore* having the central tooth oblong, broadly excavated above, and armed below with three short equidistant and equal-sized points; lateral teeth palmated or deeply divided by two wide notches, which leave three thorn-like processes, the outermost being longer and larger than either of the other two.

SHELL conic above and expanded in the middle, with a short and bluntly pointed base, solid, opaque, having scarcely any gloss: *sculpture*, numerous spiral ridges, which are sometimes regular, at other times alternately large and small, or arranged in equidistant rows or series having one of the striæ more prominent than the rest; the ridges do not extend to the suture; lines of growth microscopic and more conspicuous on the upper whorls: *colour* yellowish- or reddish-white deepening into fawn: *epidermis* very thin, nearly always wanting: *spire* tapering to a blunt point; apex mammiform: *whorls* 7–8, convex and rather tumid, compressed on the upper part towards the suture; the last occupies more than two-thirds of the shell: *suture* wide but not deep: *mouth* (exclusive of the canal) angularly oval, considerably expanding outwards; length altogether about four-ninths of the shell: *canal* broad, turning to the left, and ending in a deep obtuse-angled or curved notch: *outer lip* semicircular, bevelled to a reflected and thickened edge, not much contracted above; inside smooth, often of a deeper hue than the outside, and sometimes orange: *inner lip* in aged specimens continuous with the outer lip, and making together an angle corresponding with that of the mouth; it varies in thickness, being frequently perceptible on the lower side only: *base* strengthened by a thick and occasionally rugged fold or ridge: *pillar* flexuous and broad, sharply angulated on the lower part: *operculum* strong, marked by numerous semi-elliptical striæ in the line of growth. L. 3·25. B. 2.

Var. 1. *alba*. White, and of a much larger size; body-whorl and mouth often greatly expanded. 2. *ventricosa*. Thinner; whorls more swollen. 3. *striata*. Spiral striæ stronger, and two on each of the upper whorls forming prominent ridges. (*Murex carinatus* of Turton, not of Pennant.) 4. *gracilis*. Slender, thinner, and spirally ridged.

Monstr. 1. *contrarium*. Spire reversed. (*Murex contrarius*, Linn. = *F. sinistrorsus*, Desh.) 2. *acuminatum*. Spire elongated. 3. *scalariforme*. Whorls more or less detached. 4. *cinctum*. Encircled with a sharp ridge at the top or in the middle of the lower whorls, now and then bicarinated. 5. *sulcatum*. Lower whorls furrowed in the middle, and outer lip notched, like a *Pleurotoma*. 6. *Babylonicum*. Spire turreted. (*F. Babylonicus*, Brown.) 7. *compressum*. Squeezed in at the sides; mouth narrow. 8. *volutæforme*. Shaped like a *Voluta*. (*Buccinum undatum* has an analogous form.) 9. *varicosum*. Former outer lip, sometimes two or three, persistent. 10. *contortum*. Spire twisted on one side or inwards. 11. *suffultum*. Basal ridge continued to the periphery. 12. *bioperculatum*. Having two opercula.

HABITAT: Coralline zone, from Cornwall (Couch) and the south-eastern coast of England northwards to Shetland, where it lives also in the laminarian and deep-water zones; on the western coast it ranges from Fishguard and Barmouth (J. G. J.) to Shetland; throughout Ireland, from Bantry Bay (Humphreys) eastward to Dublin Bay, and along the North Channel. It has not been found, or noticed, in Devon or the Bristol Channel; but Pulteney gives Dorset, and Dodd Pontac in Jersey, as localities. The 1st variety seems peculiar to the Cheshire coast; the 2nd to deep water outside the Dogger bank; the 3rd to the south and south-east of Ireland, Dublin Bay (O'Kelly, *fide* Turton), the Hebrides, and Shetland; the 4th was dredged off Cape Clear. The monstrosities are chiefly from Kent and Lincolnshire; Mr. Hyndman has noticed one having an intorted spire as found at Groomsport by Mr. Vance. *F. antiquus* occurs in most, if not all, of our raised beaches (including Moel Tryfaen, Wexford, and Stornoway); Belfast (Grainger); boulder-clay at Wick (Peach); Clyde beds (Smith and others); Mammalian and Red Crag (S. Wood); Belgian Crag

(Nyst). Var. *striata,* Kelsey Hill (Prestwich); Norwich Crag (Woodward); Uddevalla (J. G. J.). Monstr. *contrarium,* Wexford (Sir H. James); Kelsey Hill (Prestwich); Aberdeenshire Crag-beds (Jamieson); Sicily (Philippi); Red Crag (S. Wood); Antwerp Crag (Nyst). Monstr. *contortum,* Red Crag (S. Wood). The present distribution of this species extends from Havösund (Sars) to the Boulonnais (Bouchard), and further southwards to the Loire-Inférieure (Cailliaud), and the Charente-Inférieure (Cassaigneaud, *fide* Aucapitaine, and Des Moulins, *fide* Fischer); depths 20–40 f. The *Tritonium antiquum* of Middendorff is apparently a different species, having the upper part of the whorls more or less flattened, and being destitute of the spiral sculpture. The monstrosity *contrarium* has been recorded as taken by Michaud at Barcelona, and by M'Andrew as living on the shore at Vigo; I have it from Sicily.

This is a good bait for codfish, and a favourite delicacy of the lower working-classes in London. At Billingsgate it is sold under the name of "almond" or "red whelk;" according to Rutty's History of Dublin the Irish call it "barnagh," the tail [liver] being said to be more fat and tender than a lobster. The egg-cases or capsules overlap one another in an imbricated fashion, each being firmly attached by its base to the underlying capsule; they are deposited in clusters of from a dozen to a hundred, the capsules in each cluster being equal in size. Those which compose one cluster, however, are not half as large as those forming another cluster, although in both cases the fry are in the same state of maturity. When they are dry, the upper or convex side shrivels, and is wrinkled or pitted; the under or flat side (which by contraction becomes concave) is of a silky texture, and divided across by a few lines; the opening is a wide slit, lying just under the top which makes a narrow flap. Before leaving the capsule the fry are perfectly formed, with conspicuous tentacles, eyes, and operculum; their shell has two whorls, the first being smooth, and the other showing a few slight incipient striæ. Each capsule produces only from two to four fry. The latter end of winter seems to be the spawning-season: on the 26th of January 1861 I examined fresh capsules which contained merely eggs immersed in a glairy liquid; and seven days afterwards I found in other capsules full-sized and living young whelks. The spawn and fry have been well described and figured by Baster in his 'Opuscula subseciva.' The sculpture of the adult shell differs according to the locality and nature of the ground; sometimes it is coarse, and at other times scarcely perceptible. Specimens from Kiel Bay are stunted and "depauperated," owing probably to the admixture of fresh water from the Baltic. In Shetland and at Berwick the fishermen make an elegant lamp of the shell, suspending it horizontally, mouth upwards, by a string round the middle, from a nail in the wall; the cavity contains oil, and the canal a wick. Now and then giants are seen, 7 or 8 inches long. The body-whorl of the female is larger than that of the male. Chemnitz knew the reversed form as a Crag fossil of Harwich; and he deplored in moving terms the indolence and apathy of naturalists in not procuring live specimens of this "most delicate monster." It is still very rare. Not only the spire of the shell, but also the curve of the operculum is reversed. I am not aware of any explanation of the phenomenon having been offered on physiological grounds. Many of the spiral mollusca are liable to this remarkable kind of malformation. Moquin-Tandon has enumerated 38 species of French land and freshwater shells, usually dextral, that have been noticed as heterostrophe, and 5 sinistral species of which orthostrophe specimens have been discovered. I have been able to add a few more examples from our own fauna. Conditions of habitability (such as the depth and mineral ingredients of water, the soil, food, and climate) do not afford any clue to the solution of the problem; for the normal and abnormal forms live together. Nor, if such be the agents, can we tell

> "Why all these things change, from their ordinance,
> Their natures and preformed faculties
> To monstrous quality."

This is the "whelke" (par éminence) of Lister, and *Buccinum magnum* of Da Costa. Pennant and others of the old English school of conchology mistook it for the *Murex despectus* of Linné; the fry is *M. decollatus* of Pennant, but not of Gmelin. The *Tritonium antiquum* of Fabricius is *F. Islandicus.* Bolten founded his genus *Neptunea,* and Swainson his genus *Chrysodomus* on the present species.

F. despectus is an arctic species, having a bathymetrical range of 8–160 f.; its southern limit is Christiansund, in lat. 63° 7′. I procured two live specimens in the Billingsgate market, mixed with *F. antiquus.* It seems that a vessel sailed from Hull for the long-line fishery at Iceland, and took a quantity of our common whelks as bait; that when the supply was exhausted, the fishermen used refuse portions of fish to catch fresh whelks on the spot; and that, on bringing their cargo of fish to England, some of the Iceland whelks that remained found their way into the London fish-market. This is one way of accounting for the casual introduction of foreign species into the British fauna. *F. despectus* is mentioned by Mr. S. Wood (as a carinated variety of his *Trophon contrarius*) from the glacial bed at Bridlington, and by Forbes (as *F. tornatus* of Gould) from Bramerton, Dalmuir, and Bridlington; it was first described by Linné, in his 'Wâstgötha Resa,' as an Uddevalla fossil. It is the *Murex carinatus* of Pennant. Donovan figured a half-grown and much cleaned (or "doctored") specimen under the name of *M. despectus* (*M. subantiquatus,* Maton and Rackett), supposing it to be Orcadian, on the vague belief of a friend. Pennant's shell (from the Portland cabinet) and that of Donovan are now in my collection.

F. fornicatus (*Tritonium fornicatum,* Fabr.) was also figured as a British species, but without any authority, by Donovan; he at first referred it to the *Murex antiquus* of Linné, but subsequently called it *M. duplicatus.* This is Greenlandic.

2. F. Norve'gicus*, (*Norvagicus*) Chemnitz.

Strombus Norvagicus, Chemn. Conch. Cab. xi. p. 218, t. 157. f. 1497–8.
F. Norvegicus, F. & H. iii. p. 428, pl. cvii. & cviii. f. 7–9.

Body pale orange or yellowish-white, irregularly streaked with purple: *mantle* thickened on the pillar-side of the shell; head-veil broad: *pallial tube* rather long, curved, and wide: *tentacles* conical, short, and flattened, bordered outside by a narrow line of purple, widely diverging; tips sometimes dark purple: *eyes* proportionally small, on bulbs or offsets at the outer base of the tentacles, where the latter are much swollen: *foot* huge, oblong, double-edged, and rounded in front, with small angular corners, very broad at the sides, and rounded or bluntly pointed behind: *verge* large: *odontophore* having an oblong rhachis, armed with five small equal cusps or points which occupy the entire base; pleuræ large, the base very long and sloping, middle deeply and widely excavated, outer fang hooked, inner fang smaller and tooth-like.

Shell shaped like a *Voluta* (the body-whorl and mouth being disproportionately large, compared with the spire, which is abruptly attenuated); it is of a porcellanous texture, not very solid, nearly opaque, and somewhat glossy: *sculpture*, extremely slight, close-set, and minute spiral striæ, which are stronger and more perceptible on the base and near the summit of the shell; some of these striæ in the middle of the last whorl form obscure ridges; top whorl smooth; there is no basal ridge or keel: *colour* pale yellowish-white or creamy: *epidermis* very thin, light yellowish-brown: *spire* short; apex bulbous, of an amber tint, larger than in the last species: *whorls* 5–6, tumid; the last is considerably produced or elongated towards the base, and occupies three-fourths of the shell: *suture* wide and deep: *mouth* angularly oval, capacious, and widely expanding outwards; length (including the canal, which appears to be part of the mouth) nearly three-fifths of the shell: *canal* very short, wide, open, nearly straight, and ending in a large and obliquely curved notch: *outer lip* semicircular, not contracted above; edge reflected, and in aged specimens thickened by the addition of many layers; inside smooth and brilliantly polished, sometimes having at the base a lovely tinge of pale fleshcolour: *inner lip* usually consisting of only a thin glaze, which is spread over the greater part of the lower side of the body-whorl; in aged specimens it is considerably thickened and folded over the lower part of the pillar and the canal; it has (as well as the inside edge of the outer lip) a prismatic lustre: *pillar* gently curved in the middle, and slightly angulated where the canal commences: *operculum* small, light horncolour, rhomboidal with three rounded corners, the fourth or basal corner being angular and forming the nucleus; layers of increase oblique; a few slight lines radiate upwards from the base. L. 4·25. B. 2·5.

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* Norwegian.

HABITAT: Coasts of Yorkshire, Durham, and Northumberland, in 50–60 f. (Bean and others); Shetland, in fine muddy sand, 70–85 f., at a distance of from 40 to 50 miles from land (J. G. J.). The locality of Bute, given by the late Mr. James Smith, must be a mistake. A variety having the spire rather longer, and approaching *F. Turtoni*, occurs in the glacial shell-mounds at Uddevalla; Norwich Crag (Middleton and Fitch, *fide* Woodward). This species ranges from Spitzbergen and the north-eastern coast of Greenland (Torell) to Norway (Spengler, *fide* Chemnitz, and others), at a depth of 100 f.

(specimens from Vadsö being very large); Iceland (Steenstrup); sea of Okhotsk (Middendoff). The Uddevalla form (*F. Largillierti*, Petit) has been recorded from Newfoundland by Petit on the authority of M. Largilliert, and from Greenland by Mörch on the authority of Herr Jörgensen.

The egg-cases were first noticed by Professor King, and figured by Mr. Howse. They are solitary. Each forms a compressed hemisphere, measuring about an inch in diameter; it is of a dirty lemoncolour, semitransparent, attached by the whole of its base to the inside of old bivalve shells and other flat substances, and edged by a rim or strip of membrane. The upper surface is covered with a thin whitish crust, which breaks up into crystalline particles, and it is finely corrugated; the underside is satiny. Ova pink or bright fleshcolour. There are in each capsule from two to four perfect fry, which make their escape through a slit in the rim. The shell has the expressive name of "wide mouth" among the north-country fishermen.

It is the type of Mörch's subgenus *Volutopsius*, and of Gray's genus *Strombella*.

3. F. Turto'ni*, Bean.

F. Turtoni, Bean in Mag. N. H. viii. p. 493, f. 61; F. & H. iii. p. 431, pl. cv. f. 3, 4, and cvi. f. 2–4.

Body white, with purple markings (Howse): *odontophore* having a small plain oblong rhachis without any cusp; pleuræ irregularly triangular, the base broad and straight, inner side sloping outwards, outer fang shaped like a canine tooth, inner fang short and cloven.

Shell of an elegant shape (not unlike that of *F. antiquus*, monstr. *acuminatum*, but having a much shorter and straight canal and a shallower suture), rather solid, nearly opaque, scarcely glossy: *sculpture*, slight and flattened, but conspicuous and regular spiral ridges, which are numerous on the body-whorl, and consist of about 15 on each of the preceding whorls; they become less distinct on the upper part of the body-whorl; top whorl smooth; there is an obscure basal ridge or keel: *colour* whitish, tinged inside with purple: *epidermis* thin, bright yellow passing into olive-green: *spire* elongated and tapering; apex remarkably conical: *whorls* 7–8, convex and somewhat angulated in the middle, compressed and shelving upwards to the suture; the last slopes towards the base, and occupies about two-thirds of the shell: *suture* distinct but not deep: *mouth* angularly oval, expanding outwards; length (including the canal) about one-half of the shell: *canal* extremely short, wide, and open, almost straight, and ending in a large, deep, and obliquely curved notch: *outer lip* semicircular and prominent, not contracted above; edge somewhat reflected; inside or throat smooth and polished, often purplish-brown: *inner lip* consisting of a porcellanous glaze, which varies in thickness according to the age of the individual; it is broad, but does not extend far beyond the pillar as in the last species: *pillar* flexuous: *operculum* large, horncolour, forming a long and oblique triangle with a pointed apex and rounded base; layers of increase close-set; a few impressed lines radiate upwards from the nucleus. L. 4·75. B. 2·5.

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* Named in honour of Dr. Turton.

HABITAT: With *F. Norvegicus*, on soft ground, in the coralline zone of Yorkshire, Durham, and Northumberland. I dredged a capsule in 78 f. on the east coast of Shetland; the same haul yielding the other species and its capsule. Vadsö, 100 f.; two large specimens (Sars).

This fine shell was discovered by a naturalist who has just passed away, full of years, after a long and zealous career. Old Bean of Scarborough (as he was familiarly called) did much by example and kind assistance to promote the cultivation of natural history in the north of England; and he was just and true in all his dealings—not a common virtue in these times. The capsules of *F. Turtoni* are pale orange, either solitary, or two together and attached side by side, not to each other, but to a rather broad membranous substratum; they are triangularly oval, the base being the narrowest part, and consist of an outer filmy sheath and an inner and thick fibrous case; the latter resembles in structure a cocoa-nut husk; the opening is a wide slit at the top. Mr. Howse found six young in one capsule. The fry are almost cylindrical and of a dark reddish-brown hue. The shell goes by the name of "long neck" among the Staithes fishermen. *F. Turtoni* is distinguishable from *F. Norvegicus* in having a longer spire, shallower suture, compressed whorls, much stronger sculpture, a conical apex, different colour, greater solidity, and especially in the shape of the operculum.

4. F. ISLAN′DICUS*, Chemnitz.

F. Islandicus, Chemn. Conch. Cab. iv. p. 159, t. 141. f. 1312–3.

SHELL regularly spindle-shaped, in consequence of the elongation of the base, not very solid for its size, nearly opaque, slightly glossy: *sculpture*, numerous spiral ridges, which are somewhat flattened on the body-whorl, but prominent on the upper whorls and the base; there are about 14 on the penultimate and each of the next four whorls, besides a few slight intermediate striæ; they do not extend to the margin below the suture; the upper two whorls are smooth; lines of growth extremely fine and close-set: *colour* white beneath the epidermis (Icelandic specimens have a pale flesh tint): *epidermis* cortical (like the bark of a birch-tree), fawncolour or yellowish-brown: *spire* elongated and gradually tapering; apex stiliform, and exhibiting a prominent bulbous point, which is broader than the first regular whorl: *whorls* 9, convex, compressed upwards; the last is attenuated towards the base, and occupies three-fifths of the shell: *suture* well defined and rather broad, but not deep: *mouth* (exclusive of the canal) oval, not expanding outwards as in the last two species; length (including the canal) rather more than two-fifths of the shell: *canal* very long, more or less straight, semitubular, ending in a wide and curved notch: *outer lip* nearly semicircular and somewhat flexuous, slightly contracted above; edge rather thin; inside smooth and polished: *inner lip* forming a glaze, the limit of which is parallel with the outer lip, not spread on the lower side; it becomes thicker towards the base, and lines the inner side of the canal: *pillar* slightly curved, and bevelled inwards: *operculum* (in a specimen from Iceland) pear-shaped, and rather thick, with oblique layers of increase. L. 5·5. B. 2.

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* Icelandic.

HABITAT: South-eastern coast of Shetland, 40–50 miles from land, in 78 f.; two specimens only were procured, both dead, but one in an excellent state of preservation. Mr. Walpole possesses a specimen from the Wexford coast. Sars, Lovén, and Danielssen have taken this species, together with *F. gracilis*, on many parts of the Norwegian coast, north of Christiansund, in 40–100 f.; M'Andrew and Barrett also dredged both in Finmark, in 30–50 f.; Iceland (Chemnitz, Mohr, and Steenstrup); Faroe Isles (Mörch); Greenland (Fabricius, as *Tritonium antiquum*, Möller, and Pingel).

It is much larger than the next species (*F. gracilis*), which has been confounded with it by many authors; *F. Islandicus* is more spindle-shaped, being produced and attenuated towards the base; the canal is much longer, and in some specimens quite straight; the whorls are more rounded; the apex is stiliform and prominent; and the ridges are less crowded, and are sharper or more raised, especially on the upper whorls. The odontophore differs nearly as much from that of *F. gracilis* as the latter does from *F. propinquus* in the same respect. The pleuræ in *F. Islandicus* and *F. gracilis* are exactly similar; but the rhachis in the present species is broader, and has three distinct and nearly equal points at the base. In *F. propinquus* the pleuræ have a more deeply lobed fang in front; and the rhachis is still broader and straight behind, with cuspidations as in *F. Islandicus*.

Dr. Jonas pointed out the distinction between *F. Is-*

landicus and *F. gracilis* (which latter he described as *F. Listeri*) in the 'Transactions of the Society of Natural Sciences at Hamburg.' The young of the present shell appears to be the *F. Sabini* of Hancock; *Buccinum Sabinii* of Gray is another species. Dr. Mörch tells me that he regards *F. Islandicus* as bearing the same relation to *F. gracilis* as *F. despectus* does to *F. antiquus.* The *Tritonium Islandicum* of Lovén is *F. Berniciensis.*

5. F. GRA'CILIS*, Da Costa.

Buccinum gracile, Da Costa, Br. Conch. p. 124, t. vi. f. 5. *F. Islandicus*, F. & H. iii. p. 416, pl. ciii. f. 1, 3, and (animal) pl. SS. f. 2.

Body white, with frequently a tinge of pale yellow: *pallial tube* short but broad, upturned when the animal crawls: *proboscis* cylindrical, very long and muscular, fleshcolour on the underside: *tentacles* triangular and flattened, short, with rounded tips; they diverge in consequence of being separated by the head-veil, which forms an intervening membrane: *eyes* small and black, nearly sessile, about halfway up the tentacles, on their outer side: *foot* oblong, squarish and double-edged in front, with angular corners, expanded at the sides, and bluntly pointed behind.

Shell broader near the base than towards the other extremity, rather solid, almost opaque, somewhat glossy: *sculpture*, numerous slight spiral ridges, which are defined on the upper whorls by impressed lines; there are about 16 on the penultimate whorl, 14 on the antepenultimate, 12 on the next, 10 on the next, 8 on the next, and 6 on the next whorl, the upper two whorls being smooth; the ridges extend to the suture on each side; lines of growth curved and very fine: *colour* white (with rarely a tinge of fleshcolour) beneath the *epidermis*: this is membranous, usually yellowish-brown, lemoncolour, or even of a paler hue in specimens from deep water; the epidermis is frequently wanting below the periphery, near the upper part of the inner lip, so as to expose a broad triangular patch the base of which is uppermost: *spire* elongated and abruptly tapering; apex irregularly mammiform, and twisted in front, but not prominent or forming a bulbous point as in the last species: *whorls* 9, less convex than in *F. Islandicus*, but likewise compressed upwards; the last is much broader towards the base, and occupies more than two-thirds of the shell: *suture* narrowish, and slightly channelled: *mouth* oblong-oval, narrower than in the last species, and acute-angled above; length (including the canal) rather more than half the shell: *canal* very much shorter than in *F. Islandicus*, turning somewhat abruptly to the left, wide, and two-thirds open, ending in a large and obliquely curved notch: *outer lip* rounded and slightly flexuous, not projecting so much as in the last species, nor contracted or incurved above; edge sharp; inside smooth and polished: *inner lip* forming a glaze, the limit of which is coextensive with the outer lip: *pillar* curved, and bevelled inwards; it is sharply angulated at the commencement of the canal[1]: *operculum* triangularly oblong, rather solid, yellowish-brown or horncolour, marked with fine and close-set lines of growth, and lengthwise with a few slight and irregular striæ or impressed lines, which radiate from the nucleus. L. 3. B. 1·25.

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* Slender.

Var. *convoluta*. Smaller, narrower, and somewhat cylindrical, more solid, with a longer spire, having sharper ridges and a deeper suture; mouth proportionally smaller.

HABITAT: Coralline and deep-sea zones, on all our coasts, from 20 to 145 f.; common on the northern fishing-banks, but rare in the south of England. The late Lord Vernon procured a specimen in the Scilly Isles, and Dr. Lukis one at Guernsey. The variety occasionally occurs in rather shallower water. *F. gracilis* has been found in quaternary deposits at Kelsey Hill (Prestwich), Macclesfield and Moel Tryfaen (Darbishire), and Wexford (James). I do not consider the Crag specimens which have been referred to this species by Searles Wood, Woodward, and Nyst identical with the above. These last agree with the North-American form, which is smaller, more tumid, and has a short spire. If such should prove to be distinct, it might be called *curtus*. The present species appears to inhabit Behring's Straits (Wossnessenski, *fide* Middendorff), White Sea and coasts of Russian Lapland (Middendorff), Iceland (Chemnitz), Faroe Isles (Mörch), Norway, as far north as Havösund, 30–100 f. (Sars and others), Sweden (Lovén and Malm), the Cattegat (Jonas), Boulonnais (Bouchard), Pirou in Brittany (De Gerville), and Loire-Inférieure, 25–30 f. (Cailliaud).

Of many hundred specimens which I have at different times examined, the males were more numerous than the females. One had no operculum nor the usual lobe by which that part is formed. The capsules are solitary, small, membranous, pouch-shaped, and attached by a broad base to stones and corallines; their surface is microscopically and closely reticulated; orifice extremely large, and sometimes having the edge partly stained with pink. Each capsule contains only a single embryonic shell, which is transparent, and through it may be seen the orange liver and two unequal-sized plumes of pale yellow gills. My largest specimens (from the Dogger bank and Exmouth) are nearly four inches long. Specimens from deep and still water are thinner than those from the coast line; others are more slender. Monstrosities now and then occur, viz. some of the ridges being prominent and keel-like; spire twisted on one side or downwards; penultimate whorl swollen; apex broken off and replaced by a shelly plug; or the operculum aborted and concave. This whelk is occasionally brought to Billingsgate market, mixed with the common eatable kinds; but it is not saleable. The fishermen call it "borer."

Lister first made known the present species, giving it a compound name (*Buccinum angustius* &c.); and it is comprehended in Linné's description of *Murex corneus*, which now represents the *F. lignarius* of Lamarck, a Mediterranean shell. Chemnitz distinguished it, as a subspecies, from *F. Islandicus*: he says that it is smaller and slenderer, has a shorter beak (canal), and that its operculum, when held against the light, is of a honeycolour. Pennant and his followers called it, after Linné, *Murex corneus*. W. Wood went further back, and adopted the first specific name given by Lister. The *Buccinum gracile* of Costa is the species at present known as *F. corneus*.

6. F. PROPIN'QUUS*, Alder.

F. propinquus, Ald. Cat. Moll. North. & Durh. (Trans. Tynes. Nat. Field Club), p. 63; F. & H. iii. p. 419, pl. ciii. f. 2, and (animal) pl. SS. f. 1.

BODY milk-white, faintly tinged with light brownish-yellow: *pallial tube* cylindrical, rather long: *head* extremely short: *tentacles* conical, tapering to a rather fine point, and diverging; lower half disproportionately thickened: *eyes* on small bulbs or offsets at the top of the stalks or enlarged portions of the tentacles: *foot* oval and thick, broader, rounded, and double-edged in front, bluntly pointed behind: *verge* falciform and flattened, on the right-hand side above the foot.

SHELL resembling *F. gracilis* in shape, but narrower, thinner, less opaque, and somewhat more glossy: *sculpture*, numerous fine spiral ridges, which extend to the suture on each side; they are rather sharp (often alternately large and small) on the lower two whorls, flattened, broader, and defined by impressed lines on the upper whorls; the penultimate and antepenultimate whorls have quite as many ridges as in the last species, but each of the preceding whorls in this has only 7 or 8 the first two whorls are smooth; lines of growth microscopic, curved, and close-set: *colour* white: *epidermis* yellowish-brown of various shades according to the habitat, being very pale and almost creamcolour in specimens from deep water, and below the periphery often of a still lighter hue; it is thin and hispid on the ridges, rising into small whitish thorn-like points; as in the last species, it is generally wanting outside the mouth, where a bare triangular patch is exposed: *spire* elongated, turreted, and gradually tapering; apex blunt, but regularly spiral and compressed, never mammiform or distorted: *whorls* 8–9, not so convex as in the last species, and rather slowly increasing; the last occupies a little more than five-eighths of the shell: *suture* narrow, deeply channelled: *mouth* oblong-oval, acute-angled above; length (including the canal) nine-sixteenths of the shell: *canal* rather short and wide, turning to the left, half open, ending in a large and obliquely curved notch: *outer lip* rounded and slightly flexuous, not projecting so much as in *F. gracilis*, but more contracted or incurved above; edge sharp and thin; inside smooth and polished: *inner lip* forming a thin glaze: *pillar* curved, bluntly angulated at the commencement of the canal: *operculum* triangularly oblong, with an oblique contour, thin, yellowish-brown or light horncolour, somewhat concave and furrowed lengthwise at the distance of about one-third from the outer lip, marked with fine and numerous but irregular laminæ of growth, and sometimes with a few slight impressed lines down the middle, which radiate from the nucleus. L. 1·75. B. 0·75.

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* Resembling (sc. *F. gracilis*).

Var. *turrita*. Smaller and thinner, more slender and almost cylindrical, with a longer spire. *Tritonium turritum*, Sars, Arct. Moll. Norg. in Vet. Forh. Christ. (1858) p. 39.

HABITAT: Muddy and sandy ground in the coralline and deep-water zones on the coasts of Yorkshire, Durham, and Northumberland, Berwick Bay, Aberdeenshire, Hebrides, and Shetland; New Brighton, near Liverpool (Collingwood); Dublin Bay (Kinahan); Cork (Humphreys, *fide* Walpole). The variety is from 78 f. off the east of Shetland. Fossil in the Wexford raised beach (Sir H. James); glacial beds, Aberdeenshire, at a height of 150–200 feet (Jamieson). Finmark, 20–150 f. (Sars, M'Andrew, and Barrett); Kullaberg, in South Sweden (Lilljeborg); Cattegat (Jonas, as *F. Listeri*, var.).

The shell of the female is more tumid than that of the male. Capsules solitary, and attached to the inside of old bivalves; they are hemispherical, and resemble those of *F. gracilis*, but have a smaller and oval orifice; the base is margined by a narrow membrane. Embryo the colour of a pomegranate. In a young monster from Shetland the last two whorls are unnaturally swollen, so as to be not unlike the *F. ventricosus* of Gray—if that species be not identical with his *Buccinum Sabinii*, although the latter is described as having the inside of the outer lip "slightly crenated." The smaller size and more delicate texture, finer and closer sculpture, longer, turreted, and regularly tapering spire, deeper suture, hispid epidermis, less abrupt curvature of the canal, and especially the symmetrical apex will readily serve to discriminate this from the last species.

It was discovered by the late Sir Walter Trevelyan at Seaton, and noticed by Brown as a variety of *F. gracilis*. Its recognition as a species is due to the lamented Joshua Alder*. This admirable naturalist was so beloved by all his friends, that to each may be said of him,—

> "Nulli flebilior quam tibi."

F. Islandicus, var. *pygmæus*, of Gould (a North-American species) seems to bear the same relation to *F. propinquus* as his *F. Islandicus* does to *F. gracilis*.

7. F. BUCCINA'TUS†, Lamarck.

F. buccinatus, Lam. An. s. V. vii. p. 132.

SHELL differing from that of *F. propinquus* in being much larger, more ventricose and solid, and in having a conical and shorter spire; the whorls are more convex, and the last occupies eight-elevenths of the shell; the ridges on the back of the canal are stronger; the surface is covered with microscopic spiral striæ, which intersect the equally fine lines of growth, so as to produce a slight and partial decussation; the epidermis is membranous and deciduous, fibrous near the outer lip, never hispid, and of a brownish-yellow colour; the alternation of size in the spiral ridges gives a lineated appearance to that part of the epidermis on the body-whorl which is of a paler colour and situate below the periphery; the canal is proportionally shorter, much wider, and more open; the outer lip is sinuated in the middle; operculum ambercolour. L. 2·25. B. 1·15.

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* Died 21st January 1867, aged 74.

† Shaped like a *Buccinum*.

Habitat: Exmouth (coll. Clark); Torquay (King); Brixham and Plymouth (Jordan); Bantry Bay (Humphreys and J. G. J.); Waterford, Wexford, and Dublin coasts (Walpole). It inhabits sandy ground in the coralline zone, and was in most of the above instances procured by trawling; I dredged it in about 18 f. Belle-île, Morbihan (Delaunay, *fide* Taslé, as *F. propinquus*); Loire-Inférieure, with *F. gracilis* (Cailliaud, as the same); Gulf of Gascony (D'Orbigny père); ? south-west of France (Fischer, also as *F. propinquus*); Gulf of Lyons, from the stomach of a gurnard (Martin).

The fry are as distinct from those of *F. propinquus* as the adult of each from the other.

Lamarck gave no habitat; but his description is quite suitable to the present species. His reference to Born's figure of *F. vulpinus* was conjectural and erroneous.

B. Decussated by longitudinal striæ or ribs and spiral ridges.

8. F. Bernicien′sis*, King.

F. berniciensis, King in Ann. & Mag. N. H. xviii. p. 246; F. & H. iii. p. 421, pl. cv. f. 1, 2, and cvi. f. 1.

Body white or creamcolour, with a slight tinge of flesh-colour: *mantle* sometimes edged with brown: *pallial tube* extensile, occasionally protruded beyond the canal, with an expanded or trumpet-shaped opening: *proboscis* exceedingly long, measuring nearly two inches even when contracted after the death of the animal: *tentacles* conical, rather short, and close together, with bluntly pointed tips: *eyes* small and black, seated on the top of long stalks, about halfway up the tentacles: *foot* lanceolate, thick, rounded and double-edged in front; tail either pointed or blunt and somewhat truncated: *odontophore* long; rhachis square, armed below with a single projecting spine; pleuræ comb-shaped, and deeply serrated.

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* From Bernicia, the ancient name of the kingdom said to have been founded by Ida and comprising some of the northern English counties.

Shell forming a spindle of moderate length, rather solid, nearly opaque, not glossy: *sculpture*, numerous thread-like spiral ridges, which are alternately large and small on the lower whorls and equal in size on the upper whorls; there are about 6 of each size on the penultimate and each of the two preceding whorls, and 5 or 6 of the larger size only on each of the next two whorls; the larger ridges extend to the base and suture; the surface is also covered with minute and close-set curved longitudinal striæ, which by crossing the ridges produce a slight decussation, especially towards the apex; the first two whorls are smooth and glossy: *colour* pinkish-white: *epidermis* rather thick, brownish-yellow, or sometimes fawn-colour, rising into crowded prickly points on the ridges, so as to give a regularly hispid appearance: *spire* tapering to a blunt point; apex symmetrical and compressed, resembling that of the last two species: *whorls* 8, convex and in the middle tumid, rather slowly enlarging; the last occupies about two-thirds of the shell: *suture* deep: *mouth* oval; upper corner nearly rectangular; length (including the canal) about four-sevenths of the shell: *canal* of moderate length, wide, nearly straight, two-thirds open, ending in a large and obliquely curved notch: *outer lip* semicircular, flexuous, incurved above; edge somewhat thickened, reflected, and expanded; inside pinkish, slightly grooved beneath the larger ridges: *inner lip* forming a more or less thick glaze (according to the age of the individual), which is spread over a considerable part of the underside of the shell; it is reflected over the lower part of the pillar and inner side of the canal: *pillar* curved, slightly angulated at the commencement of the canal: *operculum* ear-shaped, rather thin, amber or light horncolour, somewhat concave, marked with fine and close-set oblique striæ in the line of growth and with a few impressed lines which radiate from the nucleus. L. 3·25. B. 1·625.

Var. *elegans*. More slender, and the spire elongated.

Habitat: Muddy or soft ground in the coralline zone, on the coasts of Yorkshire and Northumberland;

Aberdeenshire (Bell, *fide* Dawson). Mr. Barlee procured the variety from the outer haaf or fishing-banks on the east of Shetland; and I dredged it there in fine sand, at depths of 78–100 f., with *F. Norvegicus* and *Buccinopsis Dalei.* It is a rare species. Norway (Rasch, *fide* Lovén, as *Tritonium Islandicum*); Vadsö, 140 f. (Danielssen); Loffoden Isles and Christiansund (Sars). The last-named author likewise gives the north coast of Russia and north-west America, but without citing any authority.

The young, when fresh caught and living, look like tiny rose-buds. The colour of full-grown specimens (especially of the inside) is not less beautiful; these may vie with

> . . . . . . "the dappled shells,
> That drink the wave with such a rosy mouth."

9. F. FENESTRA'TUS*, Turton.

F. fenestratus, Turt. in Mag. N. H. vii. p. 351. *Buccinum fusiforme*, F. & H. iii. p. 412, pl. cx. f. 2, 3.

Body uniform white, or yellowish-white with the exception of the branchial tube, the upper or convex surface of which is deep grey with rather close-set black transverse streaks, its extremity being white: *head* narrow: *tentacles* rather short and pointed: *eyes* on the outer side of the tentacles, at about one-fourth of their length: *foot* large, truncated in front, acute-angled on every side. (Sars.)

Shell having a short base and long spire, rather thin, semi-transparent, lustreless: *sculpture*, curved longitudinal ribs, which do not extend to the lower part of the body-whorl; there are from 20 to 25 on that whorl, 18 on each of the next two, and 12–15 on each of the next two whorls, where they cease; the whole of the shell is encircled by thread-like spiral ridges or striæ, of which there are from 18 to 20 on the body-whorl, 8 on each of the next two, 6 on each of the next two, and 4 on the next whorl, the top whorl being smooth and glossy; a few small intermediate striæ traverse also all or some of the whorls; the points of intersection on the ribs are slightly nodulous: *colour* pale yellowish-white or whitish: *epidermis* rather thin, brownish-yellow, rising into numerous fine prickles on the spiral striæ; the same bald triangular patch is observable below the periphery near the mouth as in several allied species: *spire* elegantly tapering to a blunt point; apex button-shaped, symmetrical and much compressed, like that of the last three species: *whorls* 8, convex, gradually enlarging; the last occupies five-eighths of the shell: *suture* deep: *mouth* angularly oval; length (including the canal) about one-half of the shell: *canal* short, very wide, bending to the left, two-thirds open, ending in a large and obliquely curved notch: *outer lip* nearly semicircular, flexuous, abruptly incurved above; edge sharp; inside plain: *inner lip* forming a thin glaze on the pillar, but not spread over the underside of the shell: *pillar* deeply curved, bevelled inwards, and sharply angulated at the commencement of the canal: *operculum* (in a Norwegian specimen) pear-shaped, light brown, with the nucleus as in other species of *Fusus*. L. 1·7. B. 0·8.

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* Latticed, like a window.

HABITAT: "Outside Cork Harbour," in 40 f., with *Buccinum Humphreysianum,* and in the stomachs of haddock and red gurnard (Humphreys); very rare. Two living specimens were dredged between Cape Clear and Newfoundland by the master of a vessel on her voyage from Bristol (Stutchbury); Finmark, 30–160 f. in sand (M'Andrew and Barrett); Mangerfiord and Vadsö, 50–100 f. (Sars); Christiansund, 50 f. (Danielssen).

Buccinum fusiforme of Broderip; but as it belongs to the genus *Fusus,* that specific name is of course inappropriate. I proposed at one time to change it for *Broderipi,* not being then aware that Turton had described the shell under the name which I have now adopted: *Murex fenestratus* of Chemnitz is a species of *Triton.*

F. latericeus of Möller (an arctic species) was found by Sir Henry James in the Wexford deposit; it is the *Tritonium incarnatum* of Sars.

Pyrula Carica was wrongly given by Turton, in his 'Conchological Dictionary,' as a Dublin-Bay shell; it is a native of the North-American coasts. His relation of the supposed discovery made my eyes when youthful expand with prospective joy, not unmixed with wonder. Now the latter feeling is almost extinct—perhaps both of them.

Family XXIX. NAS'SIDÆ, Stimpson.

Body spiral, usually short; in other particulars agreeing with the last two families. Sexes also separate.

Shell conic-oval or oblong, of small size, variously sculptured: *spire* more or less turreted: *canal* short and abrupt: *pillar* plicated: *operculum* horny, increasing by semielliptical or curved layers; nucleus blunt and terminal.

This family has been founded lately, by Professor Stimpson, on an odontological basis, "on account of the arched form and very numerous denticles of the rhachidian tooth of the lingual ribbon." Mr. Macdonald had previously adduced another character of the same kind, in distinguishing *Nassa* from *Buccinum*, viz. "the absence of smaller denticles between the two principal fangs of the pleuræ." The shells of *Nassidæ* differ from those of *Buccinidæ* and *Muricidæ* in having the pillar plicated; the nucleus of the operculum is placed as in the last-named family.

Genus I. NASSA*, Lamarck. Pl. VI. f. 4.

Body short: *pallial tube* narrow and extended: *tentacles* of moderate length: *eyes* placed on stalks from one-third to half the way up the tentacles: *foot* large, in front broad and with angular corners; tail cloven, and furnished with two tentacle-like processes: [*odontophore*; rhachis broad, arched, pectinated; uncinus having a tooth at the base. (Lovén.)]

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* A wicker basket, with a narrow neck, for catching fish.

Shell solid: *spire* having a regular nipple-shaped apex: *mouth* oval: *outer lip* strengthened by a rib, and furrowed inside: *inner lip* expanded and thick, having a small ridge or tooth-like process on the upper part: *canal* truncated, recurved, and deeply notched: *pillar* furnished at the base with a single retired plait or fold: *operculum* ear-shaped or oval, serrated on the outer edge, and occasionally also on the inner edge near the base.

The animal of *N. mutabilis*, with its forked tail, was well described and figured by Colonna in 1575: it was in his time esteemed at Naples as a palatable and digestible morsel; and this popular taste is still the same.

The generic name originated with Klein, but it was properly applied by Lamarck. According to Woodward there are 210 recent, and 19 fossil species; the latter are comparatively modern. The recent species chiefly inhabit shallow water—although I have taken *N. incrassata* living on the shore and at a depth of 90 fathoms, and Capt. Beechey found it dead at 145 fathoms. Risso, in his unscientific fashion, quadrupled the genus.

1. Nassa reticula'ta*, Linné.

Buccinum reticulatum, Linn. S. N. p. 1204. *N. reticulata*, F. & H. iii. p. 388, pl. cviii. f. 1, 2, and (animal) pl. LL. f. 3.

Body yellowish, mottled with dark brown or sootcolour, sometimes variegated by minute flake-white points: *mantle* loose about the neck: *pallial tube* long and narrow: *tentacles* widely separated by an intermediate flap or head-veil, awl-shaped, long and slender, more than twice as thick below the eyes as above them: *eyes* small, on the top of rather long stalks, about one-third of the way up the tentacles, and forming part of them: *foot* long and broad, squarish, rounded, or bilobed, and double-edged in front, with triangular and pointed corners, notched behind: *caudal appendages* short; when the animal is in motion these are folded back over each side of the notch at the tail: *odontophore* rather long; [rhachis having the corners produced in front, and smooth-edged on each side: uncinus having a plain shaft. (Lovén.)]

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* Reticulated or net-like.

Shell having a broad base, thick, opaque, nearly lustreless: *sculpture*, strong, but not prominent, and slightly flexuous longitudinal ribs, of which there are from 15 to 20 on the body-whorl, 20 to 25 on the penultimate whorl, and nearly as many on the next whorl, the number gradually decreasing on the upper whorls; these ribs are crossed by rather deep and wide spiral striæ, 12 to 15 encircling the body-whorl (besides those at the base), 6 the penultimate, 5 the antepenultimate, and 4 each of the preceding whorls, except those constituting the apex, which are quite smooth and glossy; the basal portion is separated from the rest of the body-whorl by a broad groove (as if pinched up), and has half a dozen spiral ridges; a tubercular decussation is produced by the intersection of the ribs and striæ; the whole surface is also covered with fine microscopic spiral lines: *colour* buff, with a narrow band of purplish-brown below the suture on each whorl, and now and then traces of a broader band in the middle of the body-whorl and of another at the base, which are discernible only near the outer lip; fresh specimens are more or less distinctly marked with fine thread-like spiral lines of yellowish-brown, some of which are interrupted and form rows of spots; in such cases the number of these lines or rows is from two to four on each ridge; the mouth is white: *epidermis* extremely thin and membranous: *spire* rather short, ending in an abrupt point; apex formed of the two first whorls, and nipple-shaped: *whorls* 10, the last or body-whorl more convex than the others, but compressed towards the suture; the body-whorl occupies about two-thirds of the shell: *suture* slight: *mouth* irregularly oval: length (including the canal) about five-twelfths of the shell: *canal* rather narrow, obliquely turning to the left, and ending in a remarkably deep notch, which is very conspicuous when the shell is placed mouth downwards: *outer lip* squeezed in and acute-angled above, curved in the middle and below, with a thick edge which is scalloped at the bottom; inside thickened, and regularly fluted with from 8 to 12 tooth-like processes: *inner lip* forming a fine enamel, which is spread over a considerable part of the underside of the shell and folded behind the pillar; it is more or less tuberculated, one tubercle or tooth being more prominent and placed near the upper angle of the mouth: *pillar* nearly semicircular, furnished at the base with a retired flexuous fold or plait: *operculum* ear-shaped, light horncolour, serrated on the outer edge, and often also on the inner edge near the base; the serrature arises from the laminæ of which the operculum is composed being spinous or angulated at their external margins; lines of growth numerous and obliquely elliptical. L. 1·25. B. 0·7.

HABITAT: Sand at low-water mark, and in the laminarian zone, throughout the British Isles; common. It occurs in many of our quaternary deposits, including those at Selsea, Moel Tryfaen, and Belfast; Norway, 0–440 feet (Sars); Uddevalla (J. G. J.); Baltic provinces of Prussia (Lehmann, *fide* Rosmer); French and Italian tertiaries (Basterot, Brocchi, and others); marine beds of the Vienna basin (Hörnes). An inhabitant of the North Atlantic (from Bejan near Drontheim to Gibraltar), the Mediterranean, Adriatic, and Black Sea, at depths of 0–70 f.

The "small lattic'd Whelk" of Petiver. At the recess of each tide this mollusk buries itself in the sand in a slanting position, its lurking-place being betrayed by a little hillock. It also gets into lobster-pots, for the sake of the bait. Bouchard-Chantereaux attributes to this, as well as to other whelks, the habit of piercing and devouring bivalves. According to M. Lespés *N. reticulata* is preyed upon by a parasitic Trematode (*Cercaria sagittata*) which infests its liver. Its spawn-cases are deposited on the leaves of *Zostera* and on various other things which are left dry only at spring tides; the capsules are arranged in rows, and so closely that they overlie each other "like the brass scales of the cheek-band of a hussar" (Johnston). They are compressed pouches, each of the size of a large spangle, supported on a very short stalk, with a small opening at the top to allow the fry to escape. Mr. Peach described and figured the capsules in the Reports of two Cornish Societies for 1843 and

1844; and he has given us some amusing particulars of the fry. These behaved themselves like the fry of other Gastropods, skipping about and whirling round by means of their ciliated lobes, apparently in a state of pleasurable excitement; but it seems that the exercise was compulsory, or necessary to prevent the attacks of a swarm of Infusoria, which made short work of any tired or feeble infant *Nassa*. The shell varies considerably in size and in the length of the spire; an adult specimen, from Mr. Clark's collection, is not half an inch long.

Linné gave the Mediterranean as the only locality known to him. The present species is the *Buccinum cancellatum* &c. of Lister, *B. vulgatum* of Gmelin, and probably the *B. tessulatum* of Olivi; *B. reticulatum* of the last-named author may be the next species. The young appears to be the *B. pullus* of Pennant but not of Linné.

2. N. NI'TIDA*, Jeffreys.

Body greyish, with a slight tinge of purple, and closely speckled with flake-white: *pallial tube* cylindrical, very long, slender, and flexible: *tentacles* flattened, tapering to a fine point: *eyes* small, on stalks conjoined with the tentacles on their outside; these stalks are about half the length of the tentacles, so that the eyes are placed about the middle of the latter: *foot* broadly lanceolate, squarish and double-edged in front, with small and pointed corners, blunt and wedge-shaped behind; tail forked and ridged: *appendages* rather short and yellowish.

Shell differing from *N. reticulata* in the following particulars:—It is smaller, narrower, and remarkably glossy; the ribs are much fewer, viz. 10 to 12 on the body-whorl, 15 on the next, 16 or 17 on the next, and 18 on the next whorl, when they diminish in number upwards; occasionally the ribs are varicose; the spiral striæ or ridges are also less numerous, being 10 on the body-whorl (besides the basal ridges), 4 on the penultimate and antepenultimate, and 3 on each of the preceding whorls; the apical whorls are quite smooth and lustrous; the basal portion is smaller, and has only three or four ridges; the ribs being much more prominent than the striæ, the lower half of the shell never displays the tubercular or cancellated appearance of the other species, although the upper whorls in this are somewhat nodulous; the surface is microscopically marked with close-set longitudinal lines and a few less distinct spiral lines: *colour* purplish on a yellowish-white ground, with the ribs of the latter hue; the purple bands and lines are brighter in this species, the lines being from two to three in number: *epidermis* inconspicuous, or obscured by an earthy incrustation: *spire* turreted: *whorls* flattened; apex more globular than in the last species: *suture* deeper: *mouth* proportionally larger: *canal* not so abruptly recurved: *outer lip* strengthened by the last-formed rib, ridged within by the undersides of the spiral striæ; the intermediate furrows are sometimes stained with purple: *inner lip* much thinner, and never tuberculated: *pillar* having a slighter fold: *operculum* oval, more solid, but smaller. L. 1. B. 0·5.

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* Glossy.

HABITAT: Muddy estuaries of the Thames and Orwell rivers, in 3–5 f.; abundant. Brittany (Cailliaud); Gulf of Lyons (Martin and J. G. J.); Bonifacio, with *N. reticulata* (Susini); Mogador, in mud (M'Andrew); Adriatic (Nardo).

Among a number of specimens which I dredged in the Roach River, one had two eyes on the right-hand tentacle; the eyes were smaller than usual, and close together.

This was noticed by Montagu as a variety of *N. reticulata*. I propose it as a distinct species with some misgiving; for, although I have not yet seen any intermediate form, it has not been ascertained that the two live together, and the present form seems to be peculiar to brackish water and mud. Both these last conditions, however, prevail in Kiel Bay, where *N. reticulata* occurs in a depauperated state. The difference between that species and *N. nitida* is not less than between *N. incrassata* and *N. pygmæa*. Kiener's variety of *N. reticulata* is evidently not our shell: he distinguishes it solely by the spiral striæ being less marked.

3. N. INCRASSA'TA*, Ström.

Buccinum (*Incrassatum*), Ström in Kong. Norsk. Vid. Selsk. Skr. iv. p. 369, t. xvi. f. 25. *N. incrassata*, F. & H. iii. p. 391, pl. cviii. f. 3, 4, and (animal) pl. LL. f. 1.

BODY yellowish of various shades, closely and minutely but irregularly speckled or marked with black; there are also some milk-white flakes scattered over different parts: *pallial tube* cylindrical, very long and flexible, projecting when the animal is in motion, and recurved when it is at rest; this serves as an auxiliary tentacle or organ of touch, as well as to supply the gills with water: *head* extremely small, of a pinkish hue: *proboscis* thicker towards the point: *tentacles* thread-shaped, rather long, with rounded tips: *eyes* on stalks conjoined with the tentacles at their outer base, each stalk being nearly equal in length to that part of the tentacle which is above the eyes: *foot* triangular and expansile, slightly indented in front, with a small ear-shaped lobe or flap at each corner, bluntly pointed behind; tail forked, or furnished with two short flattened prongs or cirri; in specimens from deep water the foot is largely bilobed behind, but has no point at the tail, which is merely cloven in the middle: *odontophore* narrow; [rhachis having the corners incurved and produced in front, edge smooth on each side; uncinus broad, with a large single-spined tooth at the base. (Lovén.)]

SHELL, although small, stout and thick, opaque, somewhat glossy: *sculpture*, strong but not prominent, obliquely curved longitudinal ribs, from 15 to 18 on each of the last three whorls, the number decreasing on the upper whorls; that which margins the outer lip is extremely large and broad; the ribs are crossed by conspicuous spiral ridges or striæ, of which there are from 12 to 16 on the body-whorl, 9 to 11 on the penultimate whorl, the number proportionally diminishing upwards; the ridges below the suture are narrow and close together, those in the middle of each whorl being broader and more apart; in some specimens the ridges are finer and more thread-like than usual; the intercrossing of the sculpture produces a tubercular or nodulous decussation, the tubercles being transversely elongated; top whorls quite smooth and glossy; the basal part is separated from the rest of the body-whorl by a deep and oblique groove (as if pinched up), and has about a dozen oblique ridges or striæ, which become slight and indistinct towards the base; the whole surface (especially the interstices of the ridges) is covered with microscopic and close-set longitudinal lines: *colour* pale buff or yellowish-white, passing into purple, pink, orange, or brown, and often variegated by three broad and interrupted bands of reddish-brown, or by a narrow and broken white zone; it is occasionally milk-white; the base has a purplish-brown or chocolate blotch, the mouth is white (rarely pinkish), and the tip frequently purple or pink: *epidermis* thin and somewhat fibrous, usually abraded but sometimes retained in the interstices of the ridges: *spire* rather short, and abruptly terminating in a nipple-shaped point: *whorls* 8–9, convex, indistinctly angulated in the middle, and rapidly enlarging; the last occupies about three-fifths of the shell: *suture* rather deep: *mouth* oval, comparatively small, acute-angled above; length (including the canal) nearly one-half of the shell: *canal* narrowish, obliquely recurved to the left, ending in a remarkably deep notch, which is very conspicuous when the shell is placed with its mouth downwards: *outer lip* somewhat compressed and nearly straight above, semicircular in the middle; edge rather thin, and slightly reflected outwards; inside thickened, as well as strengthened by the labial rib, and fluted by 8–10 narrow plaits: *inner lip* forming a thick coat of enamel, which is spread over a considerable portion of the under side of the shell, and folded behind the pillar; it has just below the outer lip a plait or ridge-like process that partially winds round the upper part of the pillar, and a few other irregular and obliquely transverse processes of the same kind (or wrinkles) towards the base: *pillar* curved, furnished at the base with a flexuous fold: *operculum* ear-shaped, light horn-colour, more or less serrated on the outer edge, and often deeply jagged or notched on the inner edge near the base; lines of growth numerous, and obliquely elliptical. L. 0·6. B. 0·3.

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* Thickened.

Var. 1. *major*. Much larger. 2. *minor*. Dwarf. 3. *simulans*. One of the ribs on the body-whorl varicose.

Habitat: Everywhere, on stony ground, from low-water mark to 145 f. (Beechey). Var 1. Channel Isles. Var. 2. Filey Brigg; west coast of Scotland, 50–60 f.; Lerwick Sound. Var. 3. Whitburn (Alder); Connemara (Barlee); Lerwick (J. G. J.). This last variety, although varicose, differs from *N. pygmæa* in the angularity of the whorls, and in sculpture. Fossil in all our quaternary deposits; Norwich Crag (Witham, *fide* Woodward); Red and Coralline Crag (S. Wood); glacial and postglacial Norwegian beds, 0–460 feet (Sars); Uddevalla, 40 feet (Malm and J. G. J.); upper, middle, and lower Crag at Antwerp (Nyst); Italian tertiaries (Brocchi and others); Vienna basin (Hörnes). The present distribution in space of this common species is not less extensive, viz. from Iceland (Steenstrup) and Finmark (Sars and others) to the Azores (Drouet) and throughout the Mediterranean, Adriatic, and Ægean; depths, shore (M'Andrew) to 100 f. (Malm).

N. incrassata is a very active mollusk, and now and then changes its crawling position by leisurely floating with its foot upwards. It often gets into lobster- and whelk-pots. In the half-grown shell the outer lip is excavated within and folded inwards. The spawn-cases are solitary, yellowish, and shaped like a round flask, with a small neck or opening at the top.

It is the "small Gibraltar *Ruggle*" of Petiver. Out of 14 synonyms which I have collated it may be unnecessary to specify more than *Buccinum minutum*, Pennant, *B. ambiguum*, Pulteney, *B. Ascanias*, Bruguière, *B. macula*, Montagu, *B. coccinella*, Lamarck, and apparently *B. asperulum*, Brocchi. *B. incrassatum* of the 'Mineral Conchology' is a different species.

4. N. PYG'MÆA*, Lamarck.

Ranella pygmæa, Lam. An. s. V. vii. p. 154. *N. pygmæa*, F. & H. iii. p. 394, pl. cviii. f. 5, 6, and (animal) pl. LL. f. 2, as *N. varicosa*.

BODY more slender and invariably of a much lighter colour than that of *N. incrassata*; the pallial tube and tentacles are longer; the anterior processes of the foot are larger and more recurved; and the tail is not only forked, but has two long and pointed diverging filaments. (Clark and F. & H.)

SHELL not so stout and thick as the last species, of a more delicate texture, and decidedly glossy: *sculpture* as in *N. incrassata*, but the ribs are finer; there are from 15 to 22 on the body-whorl, 15 or 16 on the penultimate whorl, 12 on the next, becoming gradually less upwards; the labial rib is larger, and one or more of the whorls are varicose, or have extra labial ribs denoting previous periods of growth or repose; the spiral ridges or striæ are likewise fewer, never exceeding 12 on the body-whorl, and 6 on the preceding whorl; points of cancellation granular, instead of elongated tubercles; basal ridges fewer and stronger: *colour* uniform yellowish-white with a tawny tinge; the labial rib and varices are nearly white and very conspicuous; mouth purplish-brown throughout (there being no basal spot as in the last species); apex never purple or pink, although sometimes ambercolour: *spire* less abrupt: *whorls* evenly rounded, instead of angulated: *suture* not quite so deep: *mouth* less contracted: *canal* broader: *outer lip* not so much compressed above; inside fluting more prominent and tooth-like: *inner lip* thicker at the edge; plaits fewer, and not so wrinkly: *pillar* having a sharper fold: *operculum* more deeply serrated on the inner edge. L. 0·45. B. 0·225.

HABITAT: Coralline zone on the South Devon, Dorset, and Cornish coasts; Connemara (Alcock); Bantry Bay (M'Andrew, *fide* Thompson); Dublin Bay (Kinahan); co. Antrim (Waller). Brick-earth on the Nar, West Norfolk (Rose); Belfast deposit, with *N. incrassata* (Grainger). Norway, with the last species, 10–40 f. (Danielssen and Asbjörnsen); Bohuslän (Lovén); and, with the same, 4–100 f. (Malm); French coasts of the Atlantic and Mediterranean (Lucas, *fide* Lamarck and others);

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* From its pigmy size as a *Ranella*.

Spain and Portugal, 4–30 f. (M'Andrew); Italy (Costa and others); Algiers, 6–10 f. (M'Andrew and Weinkauff); Black Sea and Crimea (Middendorff); Ægean, 27 f. (Forbes).

Dr. Goodall told me that Turton introduced himself to him at Torquay, by sending in his card on which was written "Sic pictores Coi," accompanied with specimens of this shell. It reminds us somewhat of the epilogue in one of the Idyls of Theocritus, in which Menalcas is supposed to be presented with a *καλὸν ὄστρακον* as a compliment. The learned Provost of Eton, however, was anything but a piping shepherd.

It is the *Buccinum tuberculatum* and *Tritonia varicosa* of Turton, and (according to Fischer) the *B. tritonium* of De Blainville in the 'Faune Française.'

Some tropical species of *Nassa* and of the allied genus *Planaxis* have been erroneously described as European. Such are:—

N. hepatica: Weymouth (Pulteney); Lough Strangford (Brown); St. Germain-sur-Ay (De Gerville). West Indies.

N. ambigua: Weymouth (Bryer); Cork Harbour (Humphreys); Portmarnock, Dublin Bay (Turton); Herm (Lukis); north of France (De Gerville and Bouchard-Chantereaux); Toulon (Martin). A common West-Indian shell.

Planaxis lineatus=*Buccinum pediculare*, Lam., inserted in several local lists as English and French: an abundant West-Indian shell.

P. Brasilianus=*Hima lævigata*, Leach (Syn. Moll. Gr. Brit.), said to be from Plymouth (Prideaux or Cranch): South America.

Genus II. COLUMBEL'LA*, Lamarck. Pl. VI. f. 5.

Body more extended than in the last genus: *pallial tube* very long and flexible: *tentacles* short and cylindrical: *eyes* on the outer base of the tentacles: *foot* long and thick, sometimes cloven at the extremity, but without any caudal processes: [*odontophore*; rhachis crescentic, laminar, bent forward (?): uncinus having a double hook at the point, and furnished with a round wing-like lobe before the base. (Lovén.)]

Shell varying in thickness: *mouth* contracted and narrow: *outer lip* slightly sinuated on the upper part: *inner lip* not expanded, nor thick: *pillar* having a single fold at the base: *canal* deeply notched: *operculum* horny, roundish-oval, plain-edged; nucleus rounded, and obscurely concentric, placed near the base.

This connects the *Nassidæ* with the *Pleurotomatidæ*. We have but one or two species of *Columbella,* although several inhabit the coasts of North America. Two species (*C. rustica* and *C. minor*) are Mediterranean.

De Montfort capriciously changed the generic name to *Columbus*.

A. Outer lip thickened and furrowed inside; apex of the spire regularly nipple-shaped.

1. Columbella haliæ'eti†, Jeffreys.

Body whitish, delicately suffused with fleshcolour: *pallial tube* cylindrical, broader and expanded at the orifice, which is plain-edged; when the animal crawls, this part projects in front, and is straight, and nearly as long as the shell; when it is placed on its back the tube is coiled round and (as if uneasily) twisted about from side to side: *anus* at the upper corner of the mouth of the shell, on the outside; I frequently observed fæcal pellets expelled from it: *tentacles* short, cylindrical, close together at their base, and diverging outwards; tips blunt: *eyes* small, black, and globular, at the outer base of the tentacles; they appeared to be sessile and not placed on any stalk or protuberance: *foot* lanceolate, long, narrow, and thick, truncated, or bilobed and double-edged in front, with angular corners, considerably expanding towards the tail, which is in some specimens blunt and in others cloven.

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* Diminutive of *columba*, a dove.

† From the yacht 'Osprey,' by means of which this interesting species was discovered.

Shell between oval and oblong, rather solid, nearly opaque, glossy: *sculpture*, narrow and rather sharp longitudinal ribs, from 12 to 16 on the body-whorl, 14 to 20 on each of the two preceding whorls, and nearly as many on the next whorl, where they cease and are replaced by a remarkable kind of ornamentation which will be noticed presently; the ribs are flexuous on the body-whorl, and do not extend to the base, curved on the upper whorls; labial rib broad and thick; the whole surface is covered with numerous spiral striæ, which are minutely and closely beaded, in consequence of their being decussated by microscopic lines of growth; the striæ at the base are stronger than elsewhere; the three or four top whorls that form the apex have a dichotomous kind of sculpture, the lower half of each being closely and minutely striated lengthwise, and the upper half striated spirally with a Vandyke or scallop pattern: *colour* whitish, more or less distinctly but irregularly mottled with reddish-brown: *epidermis*, none perceptible: *spire* somewhat turreted, varying in length, never slender; apex swollen, nipple-shaped and abrupt: *whorls* 8, compressed but rounded, rapidly enlarging; the last occupies two-thirds of the shell: *suture* rather deep: *mouth* oval, comparatively small; length (including the canal) three-sevenths of the shell: *canal* rather broad, abruptly bending to the left, and ending in an obliquely curved notch: *outer lip* flexuous although not much curved, somewhat expanding outwards; the sinus on the upper part is very slight, but distinct; inside thickened, and fluted by half a dozen tooth-like plaits, the lowermost of which is the strongest: *inner lip* forming a glaze on that side of the mouth, not much spread over the underside of the shell; its outer edge is thickened and well defined; some specimens have two or three obscure tubercles near the base, as in typical species of *Columbella*: *pillar* curved, furnished at the base with a strong and sharp flexuous fold: *operculum* roundish-oval, thin; lines of growth semicircular. L. 0·35. B. 0·175.

Habitat: Gravelly sand, in 85–95 f. about 25 miles N.N.W. of Unst, with *Limopsis aurita, Trochus amabilis,* and *Cylichna alba*; extremely local, and nearly as rare. The deep-sea soundings taken by Capt. Hoskyns in H.M.S. 'Porcupine' off the west coast of Ireland yielded a very young specimen. Vienna tertiaries (Hörnes, as *C. corrugata*); Faluns of Touraine (Cailliaud). I also noticed in the Gottenburg Museum a very young specimen procured by the Curator, Dr. Malm, from the Eggers bank in Norway at a depth of 150 f.

The animal is very lively and active. When placed in a vessel of seawater it creeps rapidly to the surface, being apparently actuated rather by a necessity of better aërating its gills than by a curiosity to see the outer world. It also floats, like the *Rissoæ*. It is sometimes preyed on by other zoophagous mollusks, judging from the perforation of its shell. The discovery of this tertiary fossil, as well as of *Limopsis aurita*, in a living state, within a very circumscribed part of our sea-bed, shows the imperfection of the zoological record, and militates strongly against the doctrine of the successive creation of species. We must do more than scrape here and there to justify the conclusion somewhat hastily formed by certain naturalists that all the British marine mollusca are known; and after all, what an insignificant proportion do these bear to the marine mollusca of the whole globe!

Hörnes referred his shell to the *Buccinum corrugatum* of Brocchi; but that is evidently a species of *Nassa*, and, according to Philippi, one of the innumerable varieties of *N. variabilis*.

To this section of *Columbella* belong:—1. *Buccinum cinctum*, Pulteney, as from Weymouth (Bryer), which is West-Indian: 2. *Purpura picta*, Turton (not of Scacchi), as from the British Channel; Cork Harbour (Humphreys); Gulf of Lyons (Martin); this also is

West-Indian: 3. *Voluta hyalina*, Montagu, as from Dunbar (Laskey); young of *C. lactea*, a common West-Indian shell. The *V. heteroclita* of Montagu, a sinistrorsal shell, introduced on the last more than suspicious authority, is likewise exotic.

B. Outer lip thin and smooth; apex of the spire irregularly coiled. *Thesbia* (one of the sea-nymphs of Hesiod).

2. C. NANA*, Lovén.

Tritonium ?nanum, Lov. Ind. Moll. Scand. p. 12. *Mangelia nana*, F. & H. iii. p. 461, pl. cxii. f. 8.

BODY milk-white, all but the gills and liver, which are light brown: *tentacles* cylindrical, rather short [slender (Lovén)]: *eyes* proportionally large, placed on the tentacles, close to their outer bases: *foot* narrow and thin: [*odontophore* having a pleural spine almost like that of "*Manglia costata*." (Lovén.)]

SHELL spindle-shaped, resembling *Fusus gracilis* in miniature, thin, semitransparent, and glossy: *sculpture*, numerous fine and narrow spiral impressed lines, of which there are about a dozen on the penultimate whorl; they are closely and regularly punctured, so as to form rows of circular dots; top whorls very closely and microscopically corrugated in the same direction: *colour* uniform milk-white: *epidermis*, none perceptible: *spire* tapering; apex abruptly twisted: *whorls* 4½–5½, convex and evenly rounded, rather suddenly enlarging; the last occupies about three-fifths of the shell: *suture* deep, somewhat oblique: *mouth* irregularly oblong, acute-angled above: length (including the canal) two-fifths of the shell: *canal* rather broad, inclining a little (but not abruptly) to the left, and ending in a slight and obliquely curved notch: *outer lip* flexuous, retreating at the upper part, but without exhibiting any fissure or notch; it folds inwards rather than outwards; edge sharp and thin; inside quite smooth: *inner lip* slight, narrow, and even: *pillar* flexuous; fold obscure: *operculum*, none that I could detect in the moistened animal of a specimen from which I have taken an imperfect description of the soft parts. L. 0·25. B. 0·125.

HABITAT: Shetland, in the coralline zone, rare (J.

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* Dwarf.

G. J., M'Andrew and Forbes, and Barlee); Orkneys (Thomas, *fide* F. & H.). Finmark (Lovén); Christiansund, 30–40 f. (Lilljeborg); Upper Norway (M'Andrew and Barrett).

It is variable in size. We do not know the exact position, in a generic point of view, of this delicate little shell. In 1841 I named it *Fusus albus*. The *Pleurotoma nanum* of Scacchi is a very different species. Our shell is allied to *C. Holböllii*; but that has a small shield-like operculum, and is longitudinally ribbed at the top.

The last-named species is one of our glacial fossils; it has been dredged by Mr. Waller, Mr. Hyndman, and myself on the Turbot bank, co. Antrim, in 20–25 f., by Mr. Norman and myself in the Hebrides, at a depth of 60 f., and by Mr. Dawson off the Aberdeenshire coast. I found it also in the Fort William deposit. It inhabits every part of the Arctic seas, from Bergen, northwards, and the United States. The late Professor Gould described it as *Buccinum rosaceum*. This species was erroneously placed by Mörch in the genus *Mitrella* (as "*Mitsella*") of Risso.

Family XXX. PLEUROTOMATIDÆ, (*Pleurotomacea*) Lovén.

Body spiral, more or less elongated: *mantle* forming a short fold above the head for excretal purposes, the fold occupying a fissure or notch in the outer lip of the shell: *pallial tube* not protruded much beyond the canal of the shell: *head* small: *proboscis* retractile: *tentacles* placed far apart, with slender points: *eyes* on the extremity of stalks, which are conjoined with the lower portion of the tentacles, and placed outside them: *foot* lanceolate, double-edged in front, with a pointed tail: *gills* arranged in two unequal-sized plumes: *odontophore* having no central tooth ["rhachis edentula," Lovén]; pleuræ consisting of spines, which are arranged in a single row on each side and terminate in sharp points. Sexes distinct.

SHELL spindle-shaped, or forming a lengthened cone with a pointed base: *spire* tapering or turreted: *mouth* oblong: *outer lip* fissured or notched: *canal* nearly straight: *pillar* smooth: *operculum* (when present) like that of *Trophon* or *Fusus*.

This family ought to be separated from the *Conidæ*, with at least as much justice as *Muricidæ* and *Nassidæ* have been removed from the *Buccinidæ*. According to Lovén the proboscis in *Conus* is not retractile. Woodward enumerated 430 recent and 378 fossil species of *Pleurotoma*; the geographical and bathymetrical distribution of the former is very extensive.

Genus I. DEFRAN'CIA*, Millet. Pl. VII. f. 1.

SHELL spindle-shaped: *spire* tapering; apex somewhat stiliform (as in *Cerithiopsis*), finely pointed, and minutely reticulated: *mouth* open: *outer lip* fissured at its junction with the periphery; inside grooved: *operculum* none.

M. Millet constructed the present genus from some shells of the "calcaire grossier," which have the outer lip "sinué a sa partie supérieure," in contradistinction to *Pleurotoma*, in which the outer lip is notched at the side. The apex of the spire is also very different. There is, besides, a certain diversity of form and sculpture in each of these groups of species, although they are

"all affin'd and kin."

Defrancia was used by Bronn for a genus of Polyzoa; but that is a synonym of *Pelagia*, Lamouroux.

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* Named in honour of M. Defrance, a well-known French naturalist and geologist.

1. Defrancia teres*, Forbes.

Pleurotoma teres, Forbes in Ann. & Mag. N. H. xiv. p. 412, pl. ii. f. 3. *Mangelia teres*, F. & H. iii. p. 462, pl. cxiii. f. 1, 2, and (animal) pl. RR. f. 3.

Body white, minutely frosted: *pallial tube* rather short: *head* (or mentum) wedge-like, never protruded beyond the foot: *tentacles* nearly cylindrical, of moderate length, widely diverging, slightly scalloped at the edges; tips blunt: *eyes* small, on short stalks at the outer base of the tentacles: *foot* deeply indented and angulated in front, with ear-shaped and pointed corners which occasionally curl inwards and are very flexible; it is expanded at the sides, and tapers to a fine point behind.

Shell slender, rather thin, semitransparent, and somewhat glossy: *sculpture*, numerous cord-like spiral ridges, which are nearly always much broader than their insterstices; from 20 to 25 of these ridges encircle the body-whorl, 8 to 10 the next whorl, 6 or 7 the next, and others at the same rate of decrease the remaining whorls; many of those on the body-whorl and all on the upper whorls are alternately large and small; the top whorls are minutely and closely reticulated by curved cross striæ in an exquisitely beautiful fashion; the wide groove immediately below the suture (which indicates the former course of the fissure characteristic of this genus) is marked with close-set curved striæ in the line of growth; the rest of the surface is thickly covered with oblique and microscopic lines in the same direction: *colour* pale yellowish-white, prettily but irregularly spotted with reddish-brown; the spots appear to be produced by interrupted longitudinal streaks; some specimens are spotless; apex yellowish-brown: *spire* elongated and finely tapering: *whorls* 10, convex and evenly rounded; the last occupies three-fifths of the shell viewed mouth upwards, and about one-half of the shell in the contrary position: *suture* very deep, formed by the fissural groove: *mouth* pear-shaped; length a little more than two-fifths of the shell: *canal* rather broad, a little inclining to the left, and ending in a slight and obliquely curved notch: *outer lip* semicircular, furrowed within by the underside of the ridges; edge thin, scalloped or indented by the spiral sculpture: *fissure* remarkably distinct and broad, extending some way along the suture; its course can be traced throughout every part of the spire except at the apex (the fissure being apparently formed subsequently to the embryonic growth) by the striated groove, which is of a thinner substance than the other part of the shell: *inner lip* very slight and narrow: *pillar* long and nearly straight. L. 0·6. B. 0·2.

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* Rounded or well-turned.

Habitat: Shelly and sandy ground, in 15–85 f., Shetland and the west of Scotland (Forbes and others); Orkneys, in 15 and 80 f. (Thomas, *fide* F. & H.); co. Antrim (Hyndman); Connemara, 14 f. (Barlee and J. G. J.); deep-sea soundings off the west of Ireland (Hoskyns); Berwick Bay (Mennell); Durham and Northumberland (Abbes, Howse, and Alder); Plymouth (Jordan); Cornwall (Peach, Cocks, and Hockin): not common. Apparently an Appulian and Calabrian fossil, as the *Pleurotoma Renieri* of Scacchi (Philippi). It has both a northern and southern range, comprising Norway (Lovén, as *P. boreale,* and others), Sweden (Malm), north of Spain (M'Andrew), both sides of the Mediterranean (Testa, as *P. Trecchi,* Philippi, M'Andrew, and Martin), Ægean (Forbes), Adriatic (Barbieri, *fide* Brusina, as *Raphitoma Barbierii*), and Madeira and the Canaries (M'Andrew); depths 18–120 f.

It crawls slowly, and floats in a supine position like many of its congeners. My largest specimen is three-quarters of an inch long.

2. D. gra'cilis*, Montagu.

Murex gracilis, Mont. Test. Br. (i.) p. 267, t. 15. f. 5. *Mangelia gracilis,* F. & H. iii. p. 473, pl. cxiv. f. 4, and (animal) pl. RR. f. 8.

Body white, closely but irregularly speckled with pink and flake-white: *pallial tube* somewhat extensile, usually short: *head* bulbous: *tentacles* extremely short—mere points above the eyes; below the eyes they are cylindrical and stout: *eyes* proportionally large, on long stalks conjoined with the tentacles: *foot* rounded in front, with small angular corners, pointed behind.

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* Slender.

Shell of an elegant shape, rather solid, opaque, moderately glossy: *sculpture*, several strong longitudinal ribs, which are usually oblique on the body-whorl and straight on the upper whorls; the rib near the mouth, which is placed at a little distance from the outer lip, is much longer and broader than the rest; in some specimens a similar rib or varix may be observed in the middle of the body-whorl; there are from 14 to 16 ribs on this as well as on the penultimate whorl, 12 on the next, and at the same rate of decrease upwards; the top whorls are ribless; the ribs do not extend much below the periphery, nor across the sutural groove; all the whorls except that at the top (but including the sutural groove) are encircled by flattened or thread-like spiral ridges, which are very close-set and mostly alternate in size; the second whorl from the top (and sometimes also the succeeding whorl) has but a single ridge, which being in the middle imparts a keeled aspect to that part; top whorl reticulated; a slightly nodulous, but not cancellated, appearance is produced by the intersection of the ribs and ridges; the whole surface is microscopically and densely granulated lengthwise, especially in the insterstices of the ridges: *colour* pale fawn, passing into reddish-brown, or indistinctly streaked lengthwise with the latter colour; the periphery is marked by a white band, and the part below the suture is sometimes margined by a reddish-brown line which is occasionally interrupted so as to become a row of spots; the lines which separate the ribs are paler, and the ridges often of a dark hue; apex yellowish-white: *spire* elongated: *whorls* 10–11, moderately convex, the upper ones somewhat angulated; the last occupies three-fifths of the shell: *suture* broad and rather deep, formed by the fissural groove: *mouth* pear-shaped and long; length nine-twentieths of the shell: *canal* rather long, broad, and expanded at the opening; it is somewhat twisted or bent backwards, and ends in a deepish and curved notch: *outer lip* rounded; inside thickened, finely and closely furrowed; edge rather sharp, notched by the spiral ridges; it is often deeply coloured within: *fissure* deep and broad, incurved at the further extremity; it is defined outwardly by a sharp angular point; its previous course is indicated by a closed groove similar to that of the last species: *inner lip* slight and narrow, furnished very near the top of the mouth with a small tubercle or tooth: *pillar* long and flexuous. L. 1. B. 0·375.

HABITAT: Not uncommon in the coralline zone on the coasts of Guernsey, Cornwall, Devon, Bristol Channel, Ireland (west, south, and east), and the Clyde district; Anglesea (M'Andrew); Coldingham Bay, Berwickshire (Maclaurin); Dunbar (Laskey); Orkneys (Forbes); Shetland (Barlee and J. G. J.). Italian tertiaries (Philippi and Calcara). Its present known distribution is entirely southern as regards the British Isles, and comprises the sea-board of the Atlantic from Cherbourg to the Canary Isles, the Mediterranean, Adriatic, and Ægean; depths recorded by Forbes and M'Andrew 4–80 f.

Like all its molluscan kindred, it prefers, when in captivity, darkness to light. My largest British specimen is from Unst, my smallest from Guernsey; some from Corsica are very diminutive. The tubercle on the upper part of the inner lip and the angulated point on the outer lip at the commencement of the fissure are especially noticed by Millet among the characters of his genus *Defrancia.*

It is not the *Murex gracilis* of Brocchi, nor that of Scacchi. Donovan described our shell as *M. emarginatus,* Michaud as *Pleurotoma Comarmondi,* Bronn as *P. suturale,* and Costa as *P. Cyrilli*; Chiereghini called it *M. Poelarius.* The young appears to be *P. fallax* of Forbes, and is the *Fusus Branscombi* of Clark.

D. sinuosa (*Murex sinuosus,* Mont.) is allied to the present species; it is a native of the west coast of Africa. Bryer is reputed to have found it at Weymouth, Laskey at Dunbar, De Gerville at Quinéville in the north of France, and Martin in Provence.

3. D. Leufro'yi*, Michaud.

Pleurotoma Leufroyi, Mich. in Bull. Soc. Linn. Bord. ii. (1828) p. 121, f. 5, 6. *Mangelia Leufroyi*, F. & H. iii. p. 468, pl. cxiii. f. 6, 7, and (animal) pl. RR. f. 1, as *M. Lefroyi*.

Body white, with a faint tinge of yellow ("sometimes slightly tinged with purple," F. & H.): *pallial tube* conical, short, not protruded beyond the canal of the shell: *tentacles* cylindrical, rather short ("long and slender," F. & H.), with blunt tips; they widely diverge, and sometimes assume the shape of the letter V: *eyes* on thick stalks united with the tentacles at their outer base: *foot* ("very large and expanded," F. & H.) broader and indented in front, with small ear-shaped corners, bluntly pointed behind.

Shell broad towards the base, more or less solid according to habitat (being much thicker in the lower part of the littoral zone than in deep water), and for the same reason either opaque or semitransparent, rather glossy: *sculpture*, several strong curved longitudinal ribs, which extend to the base but do not cross the fissural groove or subsutural area; the body-whorl has from 14 to 18 ribs, the next 14 to 16, the next 12 to 14, and the next 10 to 12, when they rapidly decrease in number, disappearing towards the apex; the rib immediately behind the mouth is not disproportionately large; all the whorls except those which compose the apex are encircled by fine thread-like ridges or striæ, which are very close-set and occasionally alternate in size: of these may be counted more than 30 on the body-whorl, 12 on the next, 8 on the next, 6 on the next, and so on; the third whorl from the top sometimes is indistinctly keeled in the middle; fissural groove not only having 3 or 4 slight spiral ridges, but crossed by numerous fine curved striæ; the points of intersection on the upper whorls form oblong nodules, with the major axis in the direction of the spire, and are now and then muricated or prickly; the whole surface is microscopically and closely marked by the lines of growth; top whorls exquisitely reticulated by curved striæ, which cross each other diagonally, like the wirework of a fire-guard: *epidermis* thin, yellowish-brown, persistent only in the fissural groove: *colour* whitish, passing into cream-colour, variegated by irregular purplish- or reddish-brown blotches, which are arranged in two very broad zones or bands on the body-whorl (one above and the other below the periphery), and in a single band on one or more of the upper whorls; the spiral striæ are generally lineated with purplish- or reddish-brown; apex pink, orange, or reddish-brown: *spire* rather short; apex proportionally much smaller than the succeeding part, and of a different appearance: *whorls* 8–9, swollen, rapidly enlarging: the last occupies two-thirds of the shell: *suture* deep: *mouth* pear-shaped, sinuated above, and expanding outwards; length from the commencement of the fissure to the extremity of the canal about half the shell: *canal* rather short, wide, nearly straight, and ending in an obliquely rounded but not conspicuous notch: *outer lip* curved; inside more or less thickened, and slightly furrowed; edge rather sharp, finely and closely notched by the spiral striæ: *fissure* wide but not very deep, forming an incurved notch rather than a slit; it is defined outwardly by an angular point: *inner lip* slight, frequently exhibiting an attrition by the foot in that part instead of the usual layer deposited by the mantle: *pillar* rather long and flexuous. L. 0·6. B. 0·25.

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* A complimentary dedication by Professor Michaud to his friend M. Leufroy.

Var. *carnosula*. Pale fleshcolour; length sometimes eight- and even nine-tenths of an inch.

Habitat: Stony ground, from low-water mark of spring tides at Herm (Gallienne) to 90 f. off Unst (J. G. J.); local. I will mention the principal places where it has been taken:—Guernsey (Metcalfe and others); Falmouth (Hockin); Whitburn (Abbes, *fide* Alder); Connemara (Barlee and J. G. J.); Cork (Humphreys); co. Antrim (Hyndman and Waller); west of Scotland (Smith and others); Orkneys (Thomas, *fide* F. & H.); Shetland (Fleming and others). The variety is from the last-named district. Glacial deposit at Wick (Peach); Red Crag (S. Wood); upper tertiaries of Italy (Philippi, Calcara, and Hörnes). Inhabiting the coasts of Bergen (Sars), Bohuslän, 20–30 f. (Malm), Brittany (Delaunay, *fide* Taslé), Corunna (M'Andrew and H. Woodward), Gibraltar, 10 f., and Canary Isles, 12 f. (M'Andrew), Mediterranean (Michaud and others), Adriatic (Chiereghini and others), and Ægean (Forbes).

It frequently turns upon its back and floats. The shell varies in size and in the length of the spire. Specimens from the Clyde district resemble those of the Mediterranean in their deep but bright colour.

Fleming described this species as *Pleurotoma sinuosa*, supposing it to be the *Murex sinuosus* of Montagu; it is the *P. zonalis* of Delle Chiaje, *P. inflata* of Cristofori and Jan, *P. concinna* of Scacchi, *Fusus Boothii* of Brown, and (according to Nardo) *Murex caudicula* of Chiereghini. *P. Leufroyi* of Hörnes appears different.

4. D. LINEA'RIS*, Montagu.

Murex linearis, Mont. Test. Br. (i.) p. 261, t. 9. f. 4. *Mangelia linearis*, F. & H. iii. p. 470, pl. cxiv. f. 1–3, and (animal) pl. RR. f. 6.

BODY white, with occasionally a faint tinge of yellow or fleshcolour, and sometimes minutely speckled with flake-white: *pallial tube* varying in compactness and length, with a wide opening: *head* very small, short, and flat: *tentacles* conico-cylindrical, extensile, occasionally saffroncolour, with bulbous tips: *eyes* rather prominent, about halfway up the tentacles, on the usual stalks: *foot* expansile, sometimes narrow and very long, more or less deeply cloven in front, with triangular and recurved corners, tapering behind to a fine point.

SHELL very much smaller than *D. Leufroyi*, and of a narrower shape, always solid, opaque, and not so glossy: *sculpture*, strong, curved, and buttress-like longitudinal ribs, which extend not only to the base but to the suture; the body-whorl and the next have each about a dozen, the next about 10, and in the same proportion upwards; these ribs are traversed by thread-like spiral striæ, of which about a dozen are on the body-whorl, 5 or 6 on the next, 4 or 5 on the next, and so on; crests of the ribs muricated; third whorl slightly keeled in the middle, and top whorls reticulated, as in the last species; the entire surface is microscopically and closely reticulated, and the lines of growth are rather distinct: *colour*

* Marked with lines.

yellowish-white, variegated by reddish-brown lines which wholly or partially decorate the spiral striæ; apex orange or purple: *spire* rather long; apex shaped as in the last species: *whorls* 8–9, rather convex; the last occupies three-fifths of the shell: *suture* deep: *mouth* pear-shaped, angulated above, and contracted; length nearly half that of the shell: *canal* rather short, moderately open, and turning to the left; notch obliquely rounded, and somewhat distinct: *outer lip* curved; inside thickened, and furrowed or toothed, the uppermost and lowermost teeth being the largest; edge sharp, crenellated by the spiral striæ: *fissure* as in the last species: *inner lip* slight and retired: *pillar* long and flexuous. L. 0·35. B. 0·175.

Var. *æqualis.* Body white, microscopically frosted: *pallial tube* rather short and wide: *tentacles* of moderate length above the eye-stalks, compressed on the upper and under sides: *eyes* proportionally large, black, placed on longish stalks: *foot* leaf-shaped, indented in front, with angular corners, broad and expanded towards the sides, and obtuse-angled behind. Shell broader than the typical form, with the whorls more rounded; ribs more numerous, and not so prominent or rugged; spiral striæ closer and finer; apex yellowish-white; coloured lines regularly distributed, and of a paler hue; in some specimens these markings are very faint or altogether wanting. L. 0·5. B. 0·225. *Mangelia linearis*, vars. *intermedia* and *pallida*, F. & H. iii. pp. 471, 472.

Habitat: Laminarian, coralline, and deep-water zones, on all our southern coasts, and occasionally also in the north. The distribution of the variety, which is equally common, is the reverse of this. Fossil in Ireland (J. Smith); post-glacial bed in Norway, 0–100 feet (Sars); Italian tertiaries (Philippi and Calcara). The typical form and the variety have an extensive range throughout the north Atlantic, from Iceland (Steenstrup) and Finmark (Sars) to Madeira and the Canaries (M‘Andrew), as well as in the Mediterranean, Adriatic, and Ægean; depths 8–70 f.

The animal is sluggish; it has the same habit of floating as its smaller congeners. The spawn-cases are separate, hemispherical, membranous, and thin, one-fifth of an inch in diameter, with a small oval hole in the centre. They are attached at the base to the inside of old bivalve shells and to other smooth surfaces. Each capsule contains from 200 to 300 fry. These are of a brown colour and exquisitely reticulated, each having a single whorl, globular, and partially umbilicate, with a roundish mouth and an incomplete canal like that of *Ianthina*. The fry, when in the capsule, are very restless, and gyrate freely by means of their ciliated front lobes. The young shell may be distinguished from that of *D. Leufroyi* by its microscopical texture, as I have described in the account of each.

Among the numerous synonyms are *Murex elegans* of Donovan, *Pleurotoma versicolor* (including *D. purpurea*, var. *Philberti*) of Scacchi, *Fusus multilinearis* of Brown, *F. Buchanensis* of Macgillivray, *Mangelia Cranchiana* of Leach, and *Raphitoma rosea* of Brusina. *Clavatula linearis* of S. Wood is unknown to me as a recent species.

5. D. RETICULA'TA*, Renier.

Murex reticulatus, Renier, Tav. alf. conch. Adr. p. 2.

Body white, with a few scattered and minute flake-white specks, and having a tinge of yellow in front and a streak of the same colour down the upper part of the foot; the tissue, examined microscopically, appears veined: *pallial tube* extensile, and therefore varying in length: *head* broad, deeply cloven in front, with an angular ridge on each side: *tentacles* rather long, slender above the eye-stalks, with pointed tips: *eyes* black and distinct; stalks about half the length of the tentacles: *foot* large and broad, deeply notched or bilobed in front, with recurved ear-shaped corners, finely pointed behind; this last character (as well as others derived from parts of an expansile nature) depends on the state of activity of the animal when observed, the tail being sometimes sharply pointed, and at other times bluntly angular or even rounded in the same individual.

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* Reticulated.

Shell having the last whorl produced into a rather long beak, of a thin texture between the ribs, semitransparent, partially glossy (especially the fissural groove and the interstices of the ribs, which frequently are glistening): *sculpture*, longitudinal and spiral ribs, nearly equally prominent, and forming by their intersection oblong spaces in a transverse direction; the points of junction are prickly; of the longitudinal ribs there are usually 15 or 16 on the body-whorl, and one or two less on the penultimate whorl, the number diminishing in that proportion upwards; they extend to the base, but never cross the fissural groove; the spiral ribs are slighter, 15 or 16 on the body-whorl, 5 on the next, 4 on the next, and so on; sometimes a very fine intermediate stria is observable between some of the spiral ribs; the third whorl from the top, and part of the second whorl are bluntly keeled by the first spiral rib, and all the apical whorls are exquisitely reticulated; the surface is faintly marked with microscopic and distant lines of growth, but not reticulated: *colour* yellow, irregularly mottled or streaked with purplish-brown; apex yellowish-brown: *spire* long and turreted; apex very small, slender, and distinct: *whorls* 9–10, convex; the last occupies three-fifths of the shell: *suture* deep: *mouth* as in the last species, but not so much contracted; length nearly half that of the shell: *canal* rather long, wide, more or less reflected at its extremity; notch obliquely rounded, not conspicuous outside: *outer lip* curved; inside thickened, and fluted by about 10 tooth-like ridges; edge sharp, crenellated by the spiral ribs: *fissure* deep, broad, and incurved; its former course is distinctly traceable: *inner lip* slight and retired: *pillar* long, in some cases nearly straight, and in others flexuous. L. 0·5. B. 0·2.

Var. *formosa*. Pure snow-white, or with a slight tinge of fleshcolour or pink, and occasionally encircled by a pale band below the periphery; spire elongated; whorls tumid. *Mangelia purpurea*, var. *asperrima*, F. & H. iii. p. 467, pl. cxiii. f. 5 (not *Fusus asperrimus* of Brown).

Habitat: Coralline zone, at Guernsey (J. G. J.); Plymouth (Jordan); Falmouth (Hockin); Birterbuy

Bay, co. Galway (Walpole); Cork (Humphreys); co. Antrim, in 60 f. off Loch Ewe, and in 43 f. on the Shetland coast (J. G. J.). The variety is from Falmouth (Cocks and Barlee); Shetland, 78–86 f. (Barlee and J. G. J.). *D. reticulata* belongs to our Red and Coralline Crag (S. Wood, as *Clavatula cancellata*), and to the Italian tertiaries (Philippi and Calcara). It is spread along the north-Atlantic coasts, from Brittany (Collard des Cherres and Taslé) to Gibraltar (M'Andrew), and throughout the Mediterranean, Adriatic, and Ægean, at depths of from 4 to 35 f. The variety has been dredged by Lilljeborg in Norway, by Lovén and Malm in Bohuslän (by the latter in 40 f.), and by Forbes in the Ægean (as var. *spinosa*) in 105 f.

This species varies remarkably in size. An Irish adult specimen is only three lines long; another, from Shetland (the varietal form), measures nearly an inch and a quarter. Those from the Mediterranean are of two kinds, one like ours, and the other (which is more usual) having a shorter spire and very tumid whorls, and averaging three-quarters of an inch in length. The latter may therefore be considered the typical form. The variety is extremely beautiful, and almost "paragons description;" it will be figured in the next volume.

It is the *Murex cancellatus* of J. Sowerby (not *Pleurotoma cancellata* of Calcara, nor *Fusus cancellatus* of Mighels and Adams, both of which appear to be also species of *Defrancia*), *M. echinatus* of Brocchi, *Pleurotoma Cordieri* of Payraudeau, *P. rude* of Scacchi, and *P. purpureum* of Philippi—not *M. purpureus* of Montagu; I described the present species as *P. scabrum*, under the impression that it was distinct from the Mediterranean shell and not merely a variety.

6. D. PURPU′REA*, Montagu.

Murex purpureus, Mont. Test. Br. (i.) p. 260, t. 9. f. 3. *Mangelia purpurea*, F. & H. iii. p. 465, pl. cxiii. f. 3, 4.

Body whitish, with a tinge of purple, minutely and closely speckled with flake-white: *pallial tube* cylindro-conical, rather long: *head* conical, short: *tentacles* spike-shaped, very short above the eye-stalks, and bluntly pointed: *eyes* placed about one-third of the way down the tentacles, from which part the tentacles increase considerably in thickness: *foot* squarish in front, with angular corners (to each of which a ridge runs from the neck or back of the head, forming an inverted V), pointed behind.

Shell less fusiform than the last species, owing to the base not being so much produced or elongated, rather solid, nearly opaque, and of a somewhat dull hue: *sculpture*, numerous and crowded, but not prominent, longitudinal and spiral ribs, which produce by their mutual decussation a granular (not prickly) appearance; the interstices are very narrow, and do not form any oblong spaces; of the longitudinal ribs there are from 20 to 24 on the body-whorl, and 18 to 20 on the next; they extend to the base, and nearly to the suture; the spiral ribs are narrower and thread-like, 24 to 28 on the body-whorl, and about a dozen on the next whorl, besides a few slight intermediate striæ; the third whorl and part of the second are bluntly keeled, and all the top whorls are finely reticulated; the microscopic texture is closely but indistinctly frosted: *colour* purplish brown, chocolate, or reddish-brown, sometimes variegated with white, fawncolour, pale yellow, or occasionally pure white, now and then encircled by a pale narrow zone below the periphery; top orange or pale yellow: *spire* long, tapering, and somewhat turreted; apex as in the allied species, but more slender: *whorls* 12, convex and rounded; the last occupies rather more than half the shell: *suture* deep: *mouth* narrowly pear-shaped, contracted above to form the fissural sinus; length two-fifths of the shell: *canal* rather short, wide, and expanding towards the orifice; it bends a little to the left; notch broad and rounded, scarcely visible outside: *outer lip* gently curved; inside white and thickened, fluted by about 15 tooth-like ridges; edge sharp, notched by the spiral ribs: *fissure* deep, rather narrow, and incurved; its previous course is not so conspicuous in this as in the last species, being partly covered by the sculpture: *inner lip* slight and retired: *pillar* flexuous. L. 1. B. 0·4.

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* Purple.

Var. 1. *Philberti*. Body pale yellowish-white, more or less tinged in front with purplish-brown, and covered with minute round flake-white dots: *pallial tube* cylindrical, rather long, projecting, and somewhat curved; it is of a darker hue than the rest of the body: *tentacles* forming compressed cylinders, rather long above, the eye-stalks: *eyes* on the tops of short stalks, which are amalgamated with the tentacles: *foot* elongated and thin; front deeply indented or notched in the middle, and expanding at each corner into an arched lobe or auricle; hinder part broad, and abruptly pointed. Shell dwarf, more solid, and particoloured; ribs less numerous, but not in proportion to the size of the shell. L. 0·4. B. 0·2. *Pleurotoma Philberti*, Michaud in Bull. Soc. Linn. Bord. iii. p. 261, f. 2, 3.

Var. 2. *oblonga*. Body light grey, mottled with purple: *pallial tube* long, purplish-brown, finely wrinkled: *tentacles* rather short, cylindrical, light grey; lower portion speckled with white: *eyes* on long stalks amalgamated with the tentacles, about halfway up the latter: *foot* narrow; front indented in the middle, with angular corners; hinder part finely pointed; sole white. Shell of the same size as the other variety, but having the spire much shorter and not turreted; the body-whorl is proportionally much larger; sculpture finer, and not so tubercular.

Habitat: Chiefly in the coralline zone and deeper water, on stony and shelly ground, along the coasts of Guernsey, Dorset, Devon, Cornwall, and Shetland; Lundy Island (M'Andrew); Isle of Man (Forbes); Cork (Humphreys). The first variety is mostly confined to the laminarian zone, and is more diffused: I dredged it off Croulin Island, Skye, in 30–40 f., close to the shore; and I found it in the Channel Isles under stones, and among *Zostera* at low-water mark; Mr. Peach and Mr. Norman have also procured it on the recess of the tide, the former at Paignton, and the latter in the Clyde district. The 2nd variety appears to be peculiar to the

Channel Isles; I obtained it alive by dredging off St. Catherine's Bay, Jersey, in 10–12 f., and dead at Guernsey, in 18 f. Fossil (var. *Philberti*)? Ireland (Smith); Coralline Crag (Wood); Touraine, south of France, and Italy (Hörnes and others). The range of this species and the variety *Philberti*, as recent, comprises Christiansund, 30–50 f. (Danielssen), Bergen (Sars), Bohuslän, 18–50 f. (Malm), north Atlantic, from Normandy to Madeira and the Canaries, Mediterranean, Adriatic, and Ægean; shore to 55 f.

The animal is sluggish. Very young shells of the typical form are extremely slender and finely pointed.

There are several obsolete or useless synonyms. *Mangelia purpurea* of Risso can scarcely be this species; he described it as subfossil only.

Genus II. PLEUROTOMA*, Lamarck. Pl. VII. f. 2.

Shell forming a more or less lengthened cone: *spire* turreted; apex regular and blunt: *mouth* narrow: *outer lip* notched at the side, below its junction with the periphery; inside smooth: *operculum* possessed by some species, and resembling in shape an elongated pear, with the nucleus or point at the base.

Although the notch in the outer lip of British species is usually slight, such is not the case in *P. nivalis*, which has as deep a slit as many typical species of *Pleurotoma*; the depth of the notch or slit is merely a comparative character.

This genus has been very unscientifically and needlessly divided by authors, and has received various names. *Mangelia* (correctly *Mangilia*, from Mangili, an Italian naturalist) is one of these synonyms, and has been attributed to Risso on Leach's authority; but Risso did not notice either the canal at the base or the notch in the outer lip, and his description might serve for *Rissoina,* species of which he in fact included in *Mangelia.*

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* From a notch in the side of the lip.

A. Inoperculated.

1. Pleurotoma striola'ta*, (Scacchi) Philippi.

P. striolatum, Phil. Moll. Sic. ii. p. 168, t. xxvi. f. 7. *Mangelia striolata,* F. & H. iii. p. 483, pl. cxiv. A. f. 1, 2.

Body white, minutely and closely speckled with flake-white, and marked with 8 or 9 bright pink spots on the *pallial tube,* which is short and rather open or scoop-shaped: *tentacles* short and thread-shaped above the eye-stalks: *eyes* placed very near the tips of the tentacles: *foot* truncated in front, very slightly auricled at the corners, and tapering behind to a point; the sole has no medial groove. (Clark.)

Shell slender, rather solid, semitransparent, not glossy, except in dead and rubbed specimens: *sculpture,* flexuous and prominent longitudinal ribs, which are remarkably high-shouldered or angulated at the top of each whorl, and extend to the suture and base; there are 9 or 10 on the body-whorl, and one less on the penultimate whorl, decreasing at the same rate upwards; the whole surface (with the exception of the apex) is traversed by fine and numerous spiral striæ, which are discernible with a low magnifying-power, but not by the naked eye; the third whorl is marked with numerous longitudinal striæ, besides the spiral striæ (which latter are stronger than usual), but there is no appearance of reticulation; the first and second whorls are smooth and glossy: *colour* buff or pale yellow, sometimes variegated by several obscure and narrow bands of reddish-brown; and occasionally the periphery is encircled by a broader purplish band, and the upper part of each whorl (just below the suture) has a second band of a purplish hue: *spire* long, tapering, and turreted; apex somewhat mammiform, but not having the peculiar character of any *Defrancia*: *whorls* 9, moderately convex, angulated by the ribs; the last whorl occupies rather more than one-half of the shell: *suture* deep: *mouth* contracted, exhibiting the labial notch near the upper part; length five-twelfths of the shell: *canal* rather long and wide; basal notch obliquely rounded:

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* Slightly striated.

outer lip not much curved, somewhat inflected; edge thin and plain: *labial notch* rather short, very distinct, and incurved; it is situate below the periphery, to which the upper corner of the outer lip is attached: *inner lip* retired, forming a moderately thick glaze: *pillar* flexuous. L. 0·6. B. 0·2.

HABITAT: Coralline zone at Exmouth (Clark and J. G. J.); Torbay (Alder); Falmouth and Land's End (Hockin); Weymouth and Guernsey (Hanley); Goodwick Bay, Pembrokeshire, 20 f. (J. G. J.); Bantry Bay, 12–15 f. (M'Andrew); Connemara (Forbes and others); west coast of Scotland (Smith and others); co. Antrim (Hyndman). Fossil in Sicily (Philippi and Calcara). Living in Christiansund, 30–40 f. (Danielssen); Norway (Lilljeborg, *fide* Danielssen); Loire-Inférieure (Cailliaud); Vigo and south coast of Portugal, Madeira, and Canary Isles, 8–60 f. (M'Andrew); Mediterranean, 8–50 f. (Philippi and others).

P. Smithii of Forbes, *P. Farrani* of Thompson, *Fusus elegans* of Brown and Leach, and *Mangelia Loveneana* of Reeve. This last-named author made also a great many other so-called species from the late Mr. Cuming's collection, which will not stand the test of criticism; but the excellent illustrations that form the chief merit of his 'Conchologia Iconica' amply compensate for such failures. *Mangelia striolata* of Risso is apparently *P. attenuata*.

P. accincta (*Murex accinctus*, Mont.), one of Laskey's pseudo-discoveries, is West-Indian.

2. P. ATTENUA'TA*, Montagu.

Murex attenuatus, Mont. Test. Br. (i.) p. 266, t. 9. f. 6. *Mangelia attenuata*, F. & H. iii. p. 488, pl. cxiii. f. 8, 9, and (animal) pl. RR. f. 5.

BODY white, with flaky specks [there are a few pink or red spots near the extremity of the pallial tube (Clark)]: *pallial tube* rather more slender than usual: *tentacles* awl-shaped, comparatively very long, close together at their bases: *eyes* on bulgings, very low down, and not far from the origin of the tentacles: *foot* truncated and acutely angulated, with auricles in front (F. & H), [when fully extended, as long as the shell (Clark)].

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* Attenuated.

Shell slender, attenuated towards each extremity, rather thin, semitransparent, very glossy: *sculpture*, fine, sharp, narrow, and flexuous longitudinal ribs, which extend to the base as well as to the suture, being apparently continued along the spire in an uninterrupted line; there are 9 on the body-whorl, and usually the same number on the next whorl, after which they dwindle upwards; the whole surface (except the apex) is covered with very slight microscopic and close-set spiral striæ, which can be detected only by a high magnifying-power; the third whorl is keeled in the middle, and has rather numerous and curved longitudinal riblets, the first two whorls being quite smooth: *colour* pale tawny, encircled by several reddish-brown lines and by a chestnut band below the periphery, sometimes also by a narrow and obscure band just below the suture; the ribs are paler: *spire* long and gradually tapering; apex as in the last species: *whorls* 9–10, moderately convex, somewhat angulated by the ribs; the last whorl occupies four-sevenths of the shell: *suture* rather deep: *mouth* contracted; length three-sevenths of the shell: *canal* straight, rather long and wide; basal notch rounded: *outer lip* flexuous, incurved; edge narrow, sharp, and plain: *labial notch* small and shallow but distinct, situate as in the last species: *inner lip* retired, forming a tolerably thick glaze: *pillar* nearly straight. L. 0·6. B. 0·2.

Habitat: Gravelly and muddy sand in the coralline zone, on the coasts of Devon and Cornwall (Montagu, Couch, and others); Guernsey (Forbes); Sark (Barlee); Bideford (Montagu); Scarborough (Bean); Goodwick Bay, Barmouth, and Bantry (J. G. J.); Cork (Humphreys); Connemara (Alcock); Dublin Bay (Turton); Lough Strangford (Dickie); Oban (Barlee); Hebrides (M'Andrew and Forbes). Fossil in Calabria and Tarento (Philippi); Professor Geikie's statement that it had been found in the Bute deposit by Mr. Crosskey is erroneous. Its present distribution is mostly southern—although Lovén and Malm have dredged it in the south of Sweden, and Sars has recorded it with doubt from Öxfjord—Atlantic coasts of France, Spain, and Portugal, from Boulogne to Gibraltar; Teneriffe (M'Andrew); Mediterranean, Adriatic, and Ægean: depths 2–40 f.

This elegant shell differs from *P. striolata* in being more slender, and highly polished; the ribs are not angulated at the top, nor is the spire turreted; the surface is smooth; and the linear markings are very peculiar. My finest specimen (for which I am indebted to the kindness of Dr. Battersby, who dredged it at Torquay) is three-quarters of an inch long.

It appears to be the *Mangelia striolata* of Risso, *P. Villiersi* of Michaud, *P. gracilis* of Scacchi, and *P. nuperrimum* of Tiberi.

3. P. COSTA'TA*, Donovan.

Murex costatus, Don. Br. Sh. iii. pl. xci. *Mangelia costata*, F. & H. iii. p. 485, pl. cxiv. A. f. 3–5, and (animal) pl. RR. f. 4.

BODY clear white, with a bluish tinge, more or less closely speckled with light purplish-brown or yellow, or with irregular flakes of milk-white: *pallial tube* cylindrical, rather long and flexible, exhibiting a notch-like fold at the opening: *tentacles* rather short, with bulbous tips, doubled in thickness for the lower half by the eye-stalks: *eyes* rather large, placed on swollen terminations of the stalks: *foot* elongated, narrow, and thick, in front truncated, gently curved, or slightly indented with small angular corners, attenuated and finely pointed behind; when the animal is at rest, the sole is strangulated or divided across in the middle: [*odontophore*, pleural spine strong, with the head or top folded back, and the side indented and gaping or incurved. (Lovén.)]

SHELL agreeing in many particulars with that of *P. atte-*

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* Ribbed.

nuata; but this is much smaller, thicker, less slender, not attenuated towards either extremity, nor glossy; the base is considerably broader in proportion; the ribs are stronger, blunter, and more angulated, and there are only 7 (or at the most 8) on the body-whorl; their interstices are somewhat concave; the spiral striæ are closer and finer: *colour* less regular, with the lines and bands broader, sometimes mottled, or the upper part of the shell chocolate, and the lower yellowish; the outside of the mouth and the throat or inside of the outer lip usually exhibit a purplish-brown blotch: *spire* less taper: *whorls* not so convex, the last occupying three-fifths of the shell: *suture* not so deep: *mouth* much narrower; length two-fifths of the shell: *canal* more curved, shorter, and broader: *outer lip* continuous with the inner lip, considerably thickened within, where it is frequently furnished with a narrow white ledge; edge not so thin or sharp: *labial notch* much deeper: *inner lip* thickened, and reflected above: *pillar* flexuous. L. 0·45. B. 0·185.

HABITAT: Generally distributed; living at low-water mark of spring tides, in rock-pools, on the coasts of Devon and Cornwall (Clark and Templer), in 95 f., on fine sand, off Unst (J. G. J.), and in 145 f. off the Mull of Galloway (Beechey). The "*P. coarctata*" of Forbes is merely the northern, and consequently larger, form of this common species. Fossil in the glacial deposit at Wexford (Sir H. James); Belfast (Grainger); Red and Coralline Crag (Wood); Norway, 70–80 feet, retaining its coloured band (Sars); Lillo near Antwerp (De Wael); Antibes (Macé). Finmark to Bohuslän, 10–70f. (Sars, Lovén, and others); Zealand (mus. Copenh.); Brittany (De Gerville and others); Arcachon (Fischer); Rochelle (D'Orbigny père); Spain and Portugal, 7–12 f. (M'Andrew); Provence (Gay); Spezzia (J. G. J.); and probably every part of the Mediterranean and Adriatic, as *P. tæniata* and under other less known names.

The *Murex costatus* of Pennant is a mixture of small shells belonging to different genera. Da Costa's *Bucci-*

num costatum is *P. septangularis.* The present species is probably *Fusus fasciatus, F. pyramidatus,* and *F. crassus* of Brown, and the young his *F. minimus*; Hanley described it as *P. Metcalfei,* and Leach as *Mangelia Pennantiana.*

P. lineolata (*Mangelia lineolata,* Risso) = *P. multilineolatum,* Desh. = *Fusus lineatus,* Brown, is a Mediterranean and Adriatic shell, closely allied to *P. costatum*; it was described and figured by Leach as *Mangelia lineata* and recorded from Cork on the authority of Dr. Drummond.

P. proximum (*Murex proximus,* Mont.) is West-Indian. Laskey pretended to have found it on "Tyningham sands, near Dunbar." The specimen in the British Museum, marked "mus. Montagu," however, is a worn *P. nebula,* and quite unlike the description and figure given by the author.

4. P. RUGULO'SA*, Philippi.

P. rugulosum, Phil. Moll. Sic. ii. p. 169, t. xxvi. f. 8.

SHELL at first sight mistakeable for a small and stumpy *P. costata*; but the following characters will serve to distinguish it. The present species is more solid, and has a broader base and shorter spire; the ribs are thicker, and angulated near the top of each whorl, so as to give a turreted appearance to the shell; another and peculiar difference is that, instead of the spiral striæ being uniform, some of them are larger and more raised than the rest, viz. about a dozen on the body-whorl, and 4 on the preceding whorl; the colour is tawny, or yellowish-white, with sometimes an obscure reddish-brown band on the periphery; the whorls are only 7 in number, and end abruptly; the canal is truncated; and the outer lip is remarkably thick, and never has a ledge on the inside. L. 0·25. B. 0·125.

HABITAT: Bay in St. Merryn Parish, Cornwall (Hockin); Padstow (Goodall, *fide* Leach). Fossil in Sicily and Calabria (Philippi and Calcara). An inhabitant of the Mediterranean, Adriatic, and Ægean seas.

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* Slightly wrinkled.

Mangelia Goodalliana, Leach (whose typical specimen is in the British Museum), and *Raphitoma Sandrii*, Brusina.

5. P. BRACHY'STOMA*, (*brachystomum*) Philippi.

P. brachystomum, Phil. Moll. Sic. ii. p. 169, t. xxvi. f. 10. *Mangelia brachystoma*, F. & H. iii. p. 480, pl. cxiv. f. 5, 6, and (animal) pl. RR. f. 2.

BODY whitish, minutely speckled with flake-white [purplish-white (F. & H.)]: *pallial tube* cylindrical and long, projecting in front: *tentacles* short, with blunt tips: *eyes* large, on the thickened end of stalks which are two-thirds the length of the tentacles: *foot* very long and narrowish, truncated or indented in front, with a rather large flap or auricle at each corner, bluntly pointed behind.

SHELL cylindrical, and pointed at each extremity, solid, nearly opaque, of a rather dull aspect: *sculpture*, strong, broad, rounded, and rather prominent longitudinal ribs, from 7 to 9 on each of the last three whorls; they extend to the base, but not quite to the suture, the space below which is strongly and spirally sculptured; the whole surface (except the apex) is covered with thread-like spiral ridges, which are finely and closely reticulated by microscopic longitudinal striæ, making the crests of the principal ridges (especially of those below the suture) beaded and the surface roughened; these ridges are more or less wavy and of different sizes, the larger and more conspicuous numbering about 15 on the body-whorl, 5 or 6 on the next whorl, and decreasing upwards; the third whorl has several minute curved striæ in the line of growth, their interstices being pitted, or the striæ granulated, by the intersection of four or five equally minute spiral striæ; the top whorls are smooth and glossy: *colour* yellowish-white, orange, or occasionally deep reddish-brown; paler specimens sometimes exhibit traces of a broad orange band below the periphery: *spire* turreted, and gradually tapering to a somewhat abrupt and blunt point: *whorls* 8–9, moderately convex, somewhat flattened or shelf-like at the top, and angulated by the ribs; the last whorl occupies six-elevenths of the shell: *suture* deep: *mouth* narrow, compressed and acute-angled above, and broader in the middle; length nearly four-elevenths of the shell: *canal* short, straight, and wide, expanding at the extremity in full-grown specimens; basal notch obliquely incurved: *outer lip* flexuous, slightly bent inwards; edge sharp and muricated by the extremities of the spiral striæ: *labial notch* small and short, situate on the shelf-like ledge at the top of the body-whorl: *inner lip* retired, finely polished: *pillar* short and nearly straight. L. 0·275. B. 0·1.

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* Short-mouth.

HABITAT: Mud among stones, and muddy sand, in 10–60 f., Weymouth (Thompson), Exmouth (Clark), Torquay (Battersby and J. G. J.), Plymouth (Barlee and Jordan), Falmouth (Barlee and Hockin), Cornwall (M'Andrew), Whitburn (Alder), Dogger bank (Mennell), Bantry (Barlee), co. Antrim (Waller), Oban, Skye, and Loch Carron (J. G. J., Forbes, and others), Moray Firth (Gordon), Aberdeenshire (Dawson), Wick (Peach), Shetland (M'Andrew and others). Newer tertiaries at Tarento (Philippi). Christiansund, 40–50 f. (Danielssen); Bohuslän (Lovén, and in 16–50 f. Malm); Loire-Inférieure (Cailliaud); Arcachon (Fischer); Corunna to Gibraltar, 8–30 f. (M'Andrew); Malaga (M'Andrew) to Naples (Philippi) on the European coast of the Mediterranean, in 10–50 f., and on the North African coast, in 35 and 36 f. (M'Andrew and Weinkauff); Adriatic (Brusina); Ægean (Forbes, *fide* Reeve, as *P. Cycladensis*).

Most of the specimens which I received from the late Mr. Clark under this name belong to a dwarf and deep-water variety of *P. nebula*. The *Clavatula brachystoma* of Searles Wood appears to be an extinct species. Lovén described our shell as *Mangilia tiarula*.

6. P. NE'BULA*, Montagu.

Murex nebula, Mont. Test. Br. (i.) p. 267, t. 15. f. 6. *Mangelia nebula*, F. & H. iii. p. 476, pl. cxiv. f. 7, and (animal) pl. RR. f. 7.

BODY whitish, minutely speckled with yellow: *pallial tube* long and narrow: *head* small and compressed: *tentacles* short, diverging, cylindrical from the base to the eyes, and afterwards becoming less than half the size to the tips: *eyes* small and black, seated externally on the top of the thickened part of the tentacles, about one-third from their extremities: *foot* long and broad, truncated or slightly indented in front, with small and obscure angular corners, gradually tapering behind to a blunt point.

SHELL forming an elongated cone having its base or greater diameter just above the periphery, and abruptly attenuated towards the canal; it is solid, opaque, and of a rather dull and rough aspect: *sculpture*, strong, broad, rounded, and somewhat prominent longitudinal ribs, from 10 to 12 on the body-whorl, diminishing by degrees upwards; they are flexuous on the body-whorl, and nearly straight on the upper whorls; they scarcely extend to the base, and never to the suture, the space below which is spirally sculptured and is margined on the upper whorls by two close-set wavy rows of bead-like striæ; the whole surface (except the apex) is covered with very numerous spiral striæ, which are crossed by microscopic and oblique longitudinal striæ, and reticulated as in the last species; the spiral striæ are equal in size, and three times as many as in *P. brachystoma*; the third whorl has three rows of granulated striæ, the top whorls being smooth and glossy: *colour* chocolate, with the ribs sometimes of a paler hue: *spire* somewhat turreted, gradually tapering to a rather fine point: *whorls* 10–11, moderately convex, somewhat compressed towards the top of each and sloping downwards; they are angulated by the ribs; the last whorl occupies five-elevenths of the shell: *suture* rather shallow: *mouth* lozenge-shaped, compressed and acute-angled above, broader in the middle; length four-elevenths of the shell: *canal* short and wide, turning a little to the left, expanding at the extremity; basal notch incurved, and conspicuous outside: *outer lip* gently curved, slightly bent inwards; edge sharp, and closely muricated by the points of the spiral striæ: *labial notch* rather deep, placed a little below the slope which surmounts the last whorl: *inner lip* as in the preceding species: *pillar* flexuous. L. 0·55. B. 0·2.

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* From its smoky hue.

Var. 1. *abbreviata.* Dwarfed, of the usual colour.

Var. 2. *lactea.* Also dwarfed, white or yellowish-white.

Var. 3. *elongata.* BODY pale yellowish-white or whitish, marked with purplish-brown or flake-white spots of different sizes, which appear opaque when the animal is examined as a transparent object: *pallial tube* cylindrical, long and extensile: *head* semicircular, very small: *tentacles* short, cylindrical, and (without the eye-stalks) slender; the free extremities are remarkably short and finger-like, with rounded tips: *eyes* prominent, on nearly oval bulbs at the top of long and thick stalks which are conjoined with the tentacles, on their outer side (like a spliced rope), and extend from two-thirds to three-fourths of their length: *foot* very long and flexible, rounded in front, with short triangular or ear-shaped corners, narrower in the middle, and bilobed or obliquely truncated behind: *verge* falciform, situate behind the right-hand tentacle. SHELL larger, and having the spire more elongated, of a thinner and more delicate texture: *sculpture* finer and smoother: *colour* yellowish-white with the interstices of the ribs purplish-red, sometimes wholly milk-white. L. 0·75.

HABITAT: Common in sand on all the coasts of the south of England, Wales, and Ireland, from low-water mark of spring tides to the depth of a few fathoms; Scarborough (Bean); Coldingham Bay, Berwickshire (Maclaren, *fide* Johnston); Clyde district (Smith); Lamlash (Landsborough); Moray Firth (Macdonald). Var. 1. Coralline zone at Exmouth (Clark); Falmouth and co. Galway (Barlee); Whitburn (Alder). Var. 2. Aberdeenshire (Dawson). Var. 3. Deep water, Guernsey (Hanley and J. G. J.); Plymouth (Jordan); Exmouth (Clark); Arran Isle, co. Galway (Barlee); Hebrides and Shetland, in 30–90 f. (Barlee and J. G. J.). I am by no means certain that this last variety may not be specifically distinct; but I prefer reducing to increasing the number of species, unless some valid and persistent character can be made out. The typical form has occurred in a fossil state at Moel Tryfaen (Trimmer), Macclesfield (Darbishire), Italian tertiaries (Philippi and Calcara); and the variety *elongata* in the glacial drift of Caithness (Jamieson). The geographical distribution of this species at present is as follows:—As to the typical form, from the north of France (De Gerville and others) to Madeira (M'Andrew), throughout the Mediterranean (Risso and others), Adriatic (Heller and others), and Ægean (Spratt); depths 4–25 f.: as to the variety *elongata*, from Finmark (Sars) to Gottenburg, 10–30 f. (Malm), Brittany (Cailliaud), and Vigo (M'Andrew).

The animal is exceedingly active; it gives out a very dark purple dye, like that of *Scalaria communis*. Between thirty and forty years ago I observed the present species burrowing in sand at Oxwich, near Swansea, on the recess of a high tide; and I also procured it by dredging on the same coast. The Rev. R. N. Dennis tells me that specimens from Seaford Bay, when placed in a basin of sea-water, crawled to the edge and suspended themselves by a thread. A monstrosity which I found at Tenby (where *P. nebula* is very abundant) has the spire twisted and curved on one side.

Among the synonyms may be mentioned *P. Ginnanianum* of Philippi (who, by the by, omitted to notice the spiral striæ), *P. nigra* of Potiez and Michaud, and *Raphitoma polita* of Brusina. According to Vérany it is the *Mangelia costulata* of Risso's collection. *Clavatula nebula* of Searles Wood is not our species.

7. P. LÆVIGA'TA*, Philippi.

P. lævigatum, Phil. Moll. Sic. i. p. 199, t. xi. f. 17.

BODY clear white, speckled all over with opaque white: *pal-*

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* Rubbed smooth; properly *levigata*.

lial tube long and cylindrical: *head* short, cloven in front: *tentacles* cylindrical, mere club-shaped and slender points above the eyes, three or four times as thick below them: *eyes* placed outside the tentacles, at the extremities of very long stalks, which are conjoined with the tentacles in the usual manner: *foot* elongated, truncated or bilobed in front, with angular corners, bluntly pointed or sometimes swallow-tailed behind: *odontophore* simple; pleuræ diamond-shaped, with a minute notch just below the middle on the inner side.

Shell spindle-shaped, having the base broader than the apex, rather solid, nearly opaque, of a dull but smooth aspect: *sculpture*, broad and rounded, although not prominent, somewhat flexuous longitudinal ribs, which are more or less wanting on the body-whorl and do not extend to the base or suture; there are 10 or 11 on each of the preceding three whorls; the space below the suture is girded by a thickened rim, and is always ribless; the whole surface (except the apex) is covered with exceedingly numerous and fine spiral striæ, which are crossed and indistinctly beaded by still more delicate flexuous striæ in the line of growth; the spiral striæ on the body-whorl alternate in size, but elsewhere are equal; the third whorl has four rows of spiral striæ, which are not beaded as in the foregoing two species; top whorls quite smooth and lustrous: *colour* yellow, variegated with chocolate; the former colour is more perceptible as a broad band round the upper part of the body-whorl, and on the ribs in the other whorls, the interstices of the ribs in all the whorls being of the darker colour; apex chocolate: *spire* tapering to a somewhat abrupt point: *whorls* 9–10, moderately convex and rounded, shelving upwards, not angulated by the ribs; the last whorl occupies seven-twelfths of the shell: *suture* shallow: *mouth* obliquely lozenge-shaped, compressed and acute-angled above, broader at about one-third from the upper part; length five-twelfths of the shell: *canal* very short, wide, and truncated, turning slightly but abruptly to the left; basal notch incurved, conspicuous on the outside: *outer lip* curved; edge blunt and even: *labial notch* broad and rather deep, placed below the sutural rim: *inner lip* slight, but more spread and not so retired as in many other species: *pillar* broad and flexuous. L. 0·6. B. 0·225.

Var. *minor*. Dwarfed or stunted, and more slender. L. 0·3. B. 0·1.

Habitat: Between tide-marks in Belgrave Bay, Guernsey (Gallienne). The variety or smaller form inhabits the coralline zone, and occurs in the Channel Isles also, and on the coasts of Dorset, Devon, and Cornwall; Connemara (Alcock). North Atlantic, from Cherbourg (De Gerville and Macé) to Gibraltar, and westward to the Azores (M'Andrew); both sides of the Mediterranean, the Adriatic, and Ægean: depths 2–15 f.

When the tide goes out this little mollusk burrows in the sand, but not deeply, in a slanting position; and it rises to the surface when the tide comes in, like several other univalves of similar habits. Dead shells thrown up on a sandy beach, and rolled about by the waves, become polished by the attrition and appear smooth. The chief differences between *P. brachystoma*, *P. nebula*, and *P. lævigata* consist in the first being small and cylindrical, and having some of the spiral striæ larger and more prominent than the rest; the second forms an elongated cone, the spiral striæ being equal in size and more numerous; the present species is spindle-shaped and smoother, the body-whorl is nearly ribless (especially near the mouth), and the suture is thickened by a strap-like rim.

This is the *P. Metcalfei* of Hanley, and apparently the *Raphitoma polita* of Brusina.

B. Operculated.

8. P. NIVA'LIS*, Lovén.

P. nivale, Lov. Ind. Moll. Scand. p. 14.

BODY milk-white: *head* prominent, and slightly cloven in front: *mouth* or proboscidal orifice knob-like, and placed in the middle beneath the tentacular membrane: *tentacles* very short, cylindrical, and diverging, with blunt tips; they are somewhat curved and resemble the prongs of a dung-fork: *eyes* none, nor any eye-stalks: *foot* long and slender, truncated in front, and obtuse-angled behind; sole broad: *verge* falcate, on the right hand: [*odontophore* composed of thin and somewhat curved spine-shaped pleuræ, with a large head which is excavated or gapes on the lower side. (Lovén.)]

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* Snow-white.

Shell elegantly spindle-shaped, attenuated towards each end, the axis or greater diameter being nearer the base and formed of the upper portion of the body-whorl; it is of a delicate and rather thin texture, semitransparent, and not glossy: *sculpture*, numerous oblique longitudinal ribs, which are plait-like and slight on the lower two whorls (nearly wanting on the last), more prominent and nodulous on the upper whorls; they neither extend to the base nor to the suture, and occupy only the middle portion of each whorl; the whole surface (except the apex, which is quite smooth and glossy) is covered with fine and close-set spiral striæ, some of which on the body-whorl alternate in size; lines of growth microscopic and flexuous; *colour* uniform milk-white: *spire* gradually tapering to a blunt point: *whorls* 10, convex, somewhat angulated in the middle, and compressed or slightly excavated below the suture; the last whorl occupies about one-half of the shell: *suture* shallow: *mouth* of an irregular shape, long and narrow, acute-angled above; length nearly one-third of the shell: *canal* rather short, but slender, very wide and open, bending a little to the left, and ending in an obliquely curved notch: *outer lip* rounded from the labial notch to the base, with a thin and even edge: *labial notch* broad, deep, and remarkably distinct; it is placed considerably below the junction of the outer lip with the periphery: *inner lip* consisting of a thin glaze or polish, which is spread over the pillar; its limit is coextensive with the outer lip: *pillar* broad and flexuous: *operculum* pear-shaped, having the point or nucleus at the base on the inner side; it is rather small, ambercolour, and marked with elliptical lines of increase, like the valves of a *Pinna*. L. 0·85. B. 0·25.

Habitat: Fine muddy sand, east of Shetland, in 78 f.: apparently very rare; for several dredging-voyages which I have made in these seas yielded only one live and three dead specimens. Its discoverer, Professor Lovén, recorded it as Norwegian (Bergen to Finmark); and it has also been taken on the same coast by M'Andrew and Barrett, Danielssen, Sars, and Lilljeborg, at depths of from 30 to 150 f.

My largest specimen of this graceful and remarkable species exceeds an inch in length.

As Lovén well observed, it is allied to *P. torquatum* of Philippi, a Calabrian fossil; but the dimensions and figure given in the latter's work represent a much less slender shell. The lines of growth vary in strength, and are not so conspicuous in living as in dead specimens.

9. P. SEPTANGULA'RIS*, Montagu.

Murex septangularis, Mont. Test. Br. (i.) p. 260, t. 9. f. 5. *Mangelia* (*Bela*) *septangularis*, F. & H. iii. p. 458, pl. cxii. f. 6, 7, and (animal) pl. TT. f. 3.

BODY white, powdered with minute flake-white points: *mantle* rather thick at the edges: *pallial tube* fleshy, extending beyond the canal of the shell: *head* compressed, narrow, with a vertical fissure below it, from which the retractile proboscis issues: *tentacles* short, "setose" [?], coalescing at their bases: *eyes* on the external points of thick stalks annexed to the tentacles, at about two-thirds of their length: *foot* rather narrow, truncated in front, and slightly auricled, moderately long, with the termination nearly as broad behind as in front, without a trace of a distinct point, although the tail is often more or less notched. (Clark.)

SHELL forming an elongated cone with a produced base, remarkably thick, opaque, somewhat glossy: *sculpture*, strong, angular, and rather prominent longitudinal ribs, which extend to the suture but not to the base; they are flexuous on the body-whorl, and nearly straight on the upper whorls, where they usually form a continuous series along the spire; their interstices are concave; the labial rib is very large, and aged specimens frequently have a similar rib or varix on the middle of the body-whorl; there are from 7 to 9 ribs (usually 7 only) on the body-whorl, and one less on the next whorl, the number diminishing in the same ratio upwards; the whole surface (except the apex, which is quite smooth and glossy) is covered with extremely fine and close-set minute spiral striæ, which become stronger towards the base; these spiral striæ are partially decussated by irregular microscopic lines of growth: *colour* chestnut or reddish-brown, the ribs being (probably from attrition) of a paler hue or sometimes whitish; throat or inside of the outer lip purplish: *spire* extending to an abrupt point: *whorls* 8–9, moderately convex, but compressed towards the base and strongly angulated by the ribs: the last whorl occupies nearly three-fifths of the shell; the first two or three are cylindrical, and the topmost whorl is button-shaped: *suture* slight: *mouth* irregularly oblong, acute-angled above; length about two-fifths of the shell: *canal* short, nearly straight, extremely wide and open, truncated at the point, and ending in a curved notch: *outer lip* flexuous, with a sharp and even edge; it seems to form a wedge-like margin to the labial rib: *labial notch* very broad, but shallow, placed at some distance from the upper corner of the mouth: *inner lip* forming a porcellanous glaze, and occasionally thickened above so as to produce a pad or callus at the junction of the two lips: *pillar* curved in the middle, and nearly straight below: *operculum* as in the last species, sometimes folding inwards or concave down the middle. L. 0·55. B. 0·2.

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* Heptagonal, or having seven angles.

HABITAT: Laminarian and coralline zones, in 7–25 f., on our southern and western coasts (including the Bristol Channel), from Guernsey (J. G. J.) to Anglesea (M'Andrew), all Ireland, and the west of Scotland; Firth of Forth (Forbes, MS.), ? Dunbar (Laskey). ? Fossil in Ireland (Forbes); south of Italy and Palermo (Philippi and Calcara). The only northern locality that I can find recorded is Bergen, on the excellent authority of Professor Sars: the distribution south of Britain is very extensive, and comprises the coasts of France, Spain, and Portugal, the Mediterranean, Adriatic, and Ægean; Madeira and the Canary Isles (M'Andrew, as *P. secalinum*). Bathymetrical range 6–40 f.

My finest specimens were collected in Langland

Bay near Swansea; one measures three-quarters of an inch in length, and is proportionally broad and stout. An operculum in a Scotch specimen is shaped like a weaver's shuttle, and has the nucleus nearly central and the lines of growth irregularly elliptical.

This is the *Buccinum costatum* of Da Costa, *Murex septangulatus* of Donovan, and *P. ægeensis* of Forbes; to these may probably be added the following synonyms —*Mangelia Ginnania*, Risso, *P. Bertrandii*, Payraudeau, *P. heptagona*, Scacchi, and *P. costulatum*, Cantraine. *P. secalinum* of Philippi appears to be a dwarf form, having the ribs less angular and the spiral striæ more distinct. The name proposed by Da Costa takes precedence of that which I have adopted and which is so well known; but we have another still more common species called *costata*: let the older name, therefore, be consigned to oblivion, so far as it relates to the present species.

10. P. RUFA[*], Montagu.

Murex rufus, Mont. Test. Br. (i.) p. 263. *Mangelia* (*Bela*) *rufa*, F. & H. iii. p. 454, pl. cxii. f. 3–5, and (animal) pl. TT. f. 4.

BODY white, speckled with chalky flakes, and having a slight tinge of purple: *pallial tube* rather long: *tentacles* cylindrical; upper part (above the eye-stalks) extremely short, club-shaped, and of a bluish hue: *eyes* black and distinct, on the top of thick stalks: *foot* thick and broad, slightly rounded in front, and bluntly pointed behind.

SHELL oblong-fusiform, solid, nearly opaque, lustreless: *sculpture*, flexuous and rather narrow longitudinal ribs, which extend to the suture but seldom to the base, and often become indistinct or are entirely absent towards the mouth; the upper part of each rib is angular; there are usually 14 or 15 on each of the last five whorls, becoming more numerous and thread-like on the preceding whorl, and disappearing on the to whorls; the ribs are narrower than their interstices; th whole surface (except the apex, which is smooth and glossy) is covered with numerous and fine spiral striæ or lines, many of which are double; the spiral striæ or lines on the ledge or shelf below the suture are slighter and obscure, the strongest being those on the upper whorls; they are nowhere decussated by the microscopic lines of growth: *colour* purplish-brown. the ribs being frequently paler; inside of the mouth occasionally of a rich purple: *spire* turreted, and regularly tapering; apex twisted: *whorls* 7, rather convex, shelving abruptly to the suture, so as to give the turreted aspect to the spire; the last whorl occupies three-fifths of the shell: *suture* rather deep: *mouth* shaped as in *P. septangularis*, but not so acute-angled above; length two-fifths of the shell: *canal* as in the last species, except that the basal notch is more rounded: *outer lip* arched, with a thin and even edge; it is slightly angulated above: *labial notch* small, but distinct, forming an indentation in the infrasutural shelf: *inner lip* somewhat expanded, and presenting a polished appearance: *pillar* broad and flexuous: *operculum* ear-shaped, and elongated, marked lengthwise by a furrow on the pillar side; layers of increase numerous and obliquely curved. L. 0·5. B. 0·2.

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[*] Reddish.

Var. 1. *lactea*. Body milk-white; *pallial tube* short and rather broad: *tentacles* cylindrical, very short and club-shaped above the eyes, much thicker below them: *eyes* proportionally large, on the top of stalks which are amalgamated with the tentacles: *foot* rounded in front, with small angular corners, bluntly pointed behind. Shell milk-white.

Var. 2. *semicostata*. Lower whorls ribless; shell often larger than the usual size.

Var. 3. *Ulideana*. Shell orange-brown or fawncolour, with stronger sculpture. *P. Ulideana*, Thompson in Ann. & Mag. N. H. xv. p. 316, pl. xix. f. 2.

Var. 4. *Cranchii*. Ribs twisted. *Fusus Cranchii*, Brown, Ill. p. 6, pl. v. f. 5.

Var. 5. *angusta*. Shell narrower, and slender, with sharp and oblique ribs.

Habitat: Sand in the laminarian and coralline zones, on our eastern, southern, and western coasts, the Bristol and St. George's Channels, all round Ireland, and the west of Scotland; Scarborough (Bean and J. G. J.);

Northumberland and Durham (Alder and others); Aberdeenshire (Dawson); Durness, Sutherlandshire (Mrs. M'Pherson, *fide* Gordon). Var. 1. Guernsey, living with *P. lævigata* in Belgrave Bay, and dredged in 18 f. (Gallienne and J. G. J.); Exmouth (Clark): a small form of this pretty variety, mostly having the upper part of the spire tinged with purplish-brown, was procured by Mr. Hyndman from Port Ballintrae, co. Antrim. Var. 2. Channel Isles and Fishguard (J. G. J.). Var. 3. Connemara (Farran); Clyde district (Eyton); Oban, Loch Carron, and Skye (Barlee and J. G. J.). Var. 4. Falmouth (Cranch, *fide* Brown), and Plymouth (Cranch, *fide* Leach). Var. 5. Exmouth (Clark); Tenby and Manorbeer (J. G. J.). As a post-glacial or quaternary fossil this species has been in most cases mistaken for *P. pyramidalis*, Ström; I have identified *P. rufa* from only the Belfast deposit. A somewhat similar remark applies to their foreign distribution in a living state. Sars dredged some very large specimens of *P. rufa* (mixed with the other species) in Finmark; Macé and Taslé have correctly included it in their lists of Breton shells, Dr. D'Orbigny found it at Rochelle, and Fischer gives Arcachon as a locality; French coast (Potiez and Michaud).

It is the *P. nigra* of the last-named authors, and *Fusus fuscus* of Brown; the young is Turton's *Murex chordula*. Leach described the 4th variety as *Bela Cranchiana*.

P. pyramidalis is not uncommon as a post-tertiary fossil, in the Clyde beds, as well as at Macclesfield, Moel Tryfaen, Bridlington, Kelsey Hill, Wexford, and Fort William, and in Aberdeenshire and Caithness; Norwich Crag (Woodward); Uddevalla (J.G.J.); Canada (Dawson and Bell). It inhabits the arctic seas from

Bergen to Spitzbergen in one hemisphere, and from Cape Cod to Greenland in the other. This species differs from *P. rufa* in having a longer body-whorl, a smaller and more abruptly tapering (but not turreted) spire, an oblique and shallow suture, and slighter ribs. It is the *Fusus pleurotomarius* of Couthouy, and *Defrancia Vahlii* of Beck in Möller's Index.

11. P. TURRI'CULA*, Montagu.

Murex turricula, Mont. Test. Br. (i.) p. 262, t. 9. f. 1. *Mangelia turricula*, F. & H. iii. p. 450, pl. cxi. f. 7, 8, and (animal) pl. TT. f. 2.

BODY creamcolour, faintly suffused with brown, and sometimes closely covered with very minute chalk-white specks: *head* small and thick: *pallial tube* cylindrical and very long, sometimes projecting in front like a horn: *tentacles* cylindrical, extremely short above the eyes, with blunt tips: *eyes* small, placed on the extremities of stalks which are nearly three-fourths of the length of the tentacles and are annexed to (but not amalgamated with) them, giving to this part of the animal the shape of an elongated and irregular cone: *foot* large and broad, truncated or bilobed in front, with small angular corners, and bluntly pointed or rounded behind: [*odontophore*, pleural spine straight, with a conical head and the side excavated and open. (Lovén.)]

SHELL oblong-fusiform, rather solid, semitransparent, and lustreless: *sculpture*, strong, sharp, and narrow, but not very prominent longitudinal ribs; these are angular on the top of each whorl, curved on the body-whorl, and nearly straight on that portion of the other whorls which lies below the sutural ledge or step; they extend to the suture and mouth, but not to the base; each of the last five whorls has from 12 to 15 ribs, the next has more, and on the preceding whorl they become fine and close-set striæ and are separated by the stronger spiral striæ; they disappear towards the apex; the ribs are much narrower than their interstices; the whole surface (except the apex, which is quite smooth and glossy) is thickly covered with fine, and usually equal-sized, spiral striæ (with frequently slighter intermediate striæ), which are more crowded on the base as well as on the top or upper shelf of each whorl; the second whorl has only three of these spiral striæ, and two are more prominent than the rest on all the top whorls; on the third whorl and the top of the fourth the longitudinal ribs and spiral striæ, being equal in size, intersect each other and produce a cancellated appearance, the interspaces being excavated; the points of junction on the edge of the shelf at the top of each whorl are slightly nodulous; microscopic lines of growth slight: *colour* milk-white or tinted with yellow: *spire* remarkably turreted or scalar, gradually tapering to a small but truncated point: *whorls* 7–8, convex, each having on the upper part a wide step-like shelf, which is strongly angulated; the last whorl occupies four-sevenths of the shell: *suture* not deep, but well defined by a wavy line: *mouth* oblong, angular above; length three-sevenths of the shell: *canal* short and wide, nearly straight, ending in an obliquely rounded notch: *outer lip* angular at the top, and sloping downwards with a gentle curve; edge slightly crenellated by the points of the spiral striæ: *labial notch* small, having its greatest depth in the angle of the infrasutural shelf: *inner lip* rather large, presenting (as usual in this section of *Pleurotoma*) a smooth and polished surface; *pillar* broad and flexuous, sloping inwards to a rather sharp edge: *operculum* ear-shaped and elongated, marked lengthwise by a furrow on the inner or pillar side, and sometimes by one or two slight striæ in the same direction; layers of growth numerous and oblique; nucleus at the base, on the inner side. L. 0·65. B. 0·25.

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* A turret.

Var. *rosea*. Fleshcolour or reddish-brown. *Tritonium roseum* (Sars), Lovén, Ind. Moll. Scand. p. 12.

HABITAT: Sand, at various depths, in the Bristol Channel, and in the western, eastern, and northern parts of England and Wales, and on all the Irish, Scotch, and Zetlandic coasts. Donovan gives Brighton and Weymouth as localities; but I am not satisfied that this species has been found in any of our southern counties. The variety is from Oban. *P. turricula* has been noticed in all our quaternary deposits (including that at Selsea), and in the Norwich and Red Crag; Uddevalla (J. G. J.); Canada (Dawson). Its present range is mostly northern, and comprises Greenland, Spitzbergen, Iceland, Scandinavia, Heligoland (Frey and Leuckart), the Boulonnais (Bouchard-Chantereaux), Cherbourg and La Hougue (De Gerville), and the United States (Mighels and Stimpson); depths 10–150 f.

The length of the spire is a very uncertain character. Monstrosities are rare; I have one in which the mouth and canal are considerably curved. A specimen in my cabinet, from the body-whorl of which a large piece had been at one time taken away, exhibits a peculiar sort of repair: the renewed portion has no trace of longitudinal ribs, although the spiral sculpture is replaced. The largest specimens I have ever seen were dredged in from 50 to 60 f. off the Dogger bank on the Yorkshire coast; they measure three-fourths of an inch in length, and about one-third of an inch in breadth. One from Shetland is as long, but narrower.

It is probably the *Turbo albus* of Pennant, certainly the *Murex angulatus* of Donovan, and the *Fusus turricola* of Fleming and Forbes; the fry is apparently Adams's *Buccinum minutum.* Leach also placed it in the genus *Buccinum.* Through the kindness of Dr. Mörch I have compared the types of Möller's Greenlandic species with British specimens in my own collection; and I would refer the *Defrancia nobilis, scalaris,* and *exarata* of the last-named author to the present species. *Fusus discors, discrepans,* and *castaneus* of Brown may be placed in the same category. The *Murex turricula* of Brocchi (which is also a *Pleurotoma*) is very different from ours, and must have another specific name.

12. P. TREVELYA'NA*, (*Trevellianum*) Turton.

P. Trevellianum, Turt. in Mag. N. H. vii. p. 351. *Mangelia Trevelliana*, F. & H. iii. p. 452, pl. cxii. f. 1, 2.

SHELL approaching *P. turricula*, but essentially distinct. This is smaller, and more oval than oblong; the spire is not so decidedly and abruptly turreted or scalar; the whorls are rounded; the sculpture is very much finer and closer (there being twice as many longitudinal ribs); and the whole surface is decussated, in consequence of the ribs and spiral striæ being equal-sized and intercrossing; the second whorl is marked by minute and numerous spiral lines; the colour is uniformly milk-white; the canal is shorter; the labial notch is deeper; and the operculum has a strong ledge on the inner side, and is microscopically striated (as well as slightly reticulated) lengthwise. L. 0·45. B. 0·2.

HABITAT: With *P. turricula* in the stomachs of haddocks, Scarborough (Bean); muddy sand outside the Dogger bank, on the Yorkshire coast, in 50–60 f. (Leckenby); Durham and Northumberland (Alder and others); Berwick Bay (Mennell); Firth of Forth (M'Andrew); Aberdeenshire (Macgillivray and others); Eda Sound, Orkneys (Thomas, *fide* F. & H.); Shetland (Forbes and others); west coast of Scotland (Barlee and J. G. J.). Fossil in the Clyde beds (Brown and Crosskey); Hebrides (J. G. J.); Turbot-bank, co. Antrim (Hyndman and others); boulder-clay, Wick (Peach); Bridlington (Woodward); Bramerton (Witham, *fide* Woodward); Uddevalla (J. G. J.); glacial deposits in Norway, 50–240 feet (Sars); Canada (Dawson). This species is exclusively northern, and is distributed from Zealand to Spitzbergen, along the coast of Greenland westward to Massachusetts; west coast of North America (P. Carpenter): depths 8–200 f.

For my largest specimen I am indebted to my able and assiduous fellow-labourer, Mr. Robert Dawson, of Cruden, who dredged it off Kinnaird's Head; it is five lines and a half in length.

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* A complimentary dedication to Sir Walter Trevelyan, Bart.

Synonyms: *P. reticulata*, Brown, *Fusus decussatus*, Couthouy (not *P. decussata* of Lamarck, which is a Grignon fossil), and *Defrancia Woodiana*, Möller. American specimens are much smaller than ours, as is also the case with *Purpura lapillus* and *Buccinum undatum*.

Family XXXI. CYPRÆIDÆ, (*Cypræadæ*) Fleming.

Body oval or oblong: *mantle* expanded over the back of the shell in the form of two lobes (one on each side): *pallial tube* projecting or recurved: *head* furnished with a retractile proboscis or a contractile snout: *tentacles* cylindrical or awl-shaped: *eyes* on short stalks, which are conjoined with the tentacles, as in the last family: *foot* tongue-shaped, double-edged in front, weg e-shaped or bluntly pointed behind: *gills* arranged in a single plume: *odontophore* long, partly contained in the visceral cavity; rhachis 1-cusped; uncini 3-cusped. Sexes distinct.

Shell having invariably an external spire in the young state: *spire* short, usually concealed in the adult; axis nearly horizontal: *mouth* very long: *canal* short and somewhat truncated: no *epidermis*, nor any *operculum*.

These are animal-eaters, and are said to subsist principally on zoophytes. Individuals of the same species vary greatly in size; the young, before the outer lip is formed, has been in many cases considered a distinct species.

Genus I. MARGINEL'LA*, Lamarck. Pl. VII. f. 3.

BODY oval: *mantle* pustulated: *head* furnished with a retractile proboscis.

SHELL conic-oval, smooth and polished: *spire* visible in every state of growth: *mouth* nearly as long as the shell, narrow, channelled at the base only: *pillar* plicated.

Risso proposed the genus *Erato* for the reception of our only species; but I agree with Deshayes and Philippi that *Erato* cannot be distinguished from *Marginella*.

MARGINELLA LÆVIS†, Donovan.

Voluta lævis, Don. Br. Sh. v. pl. clxv. *M. lævis*, F. & H. iii. p. 502, pl. cxiv. B. f. 4, 5, and (animal) pl. NN. f. 8, 9.

BODY milk-white, closely and minutely speckled all over with orange, pink, and black; these markings are arranged in various patterns: *mantle* thick, forming two flaps which cover from one-half to two-thirds of the shell, leaving the back only exposed; these flaps or lobes are elegantly tessellated with purplish-brown, and are more or less studded with small pale yellow pustules or nipple-shaped tubercles of different sizes; the front and lower portions of each side are often marked with purplish-brown spots: *pallial tube* rather long, folded in a cylindrical form: *proboscis* white and cylindrical, more than half an inch long: *tentacles* extensile, usually rather short, with blunt tips, forked at their bases and widely diverging: *eyes* on short stalks: *foot* long and slender, slightly rounded in front, with angular corners, contracted in the middle and tapering to a blunt point or tail: *verge* very large, bent and triangular.

SHELL harp-shaped, solid, opaque, porcellanous and highly lustrous: *sculpture*, none except linear marks of growth, and a few slight and microscopic spiral striæ on the top whorls: *colour* milk-white, with a pale orange-brown tint and a pink outer lip in southern specimens: *spire* prominent, although blunt; apex somewhat globular and excentric: *whorls* 5–6; the last is gibbous, and occupies $\frac{15}{18}$ of the shell: *suture* very slight and indistinct: *mouth* nearly equal in width throughout, incurved and acute-angled above; length coextensive with that of the body-whorl: *canal* wide and open, slightly bending to the left: *outer lip* thick and broad, forming a distinct rim which is continued round the base; inside closely notched, or furnished with about 15 small teeth: *inner lip* apparently wanting: *pillar* flexuous, having two or three slight transverse plaits or folds at the base (the lowermost being the strongest or most conspicuous), besides a row of minute tubercles above the plaits, which exceed in number the teeth of the outer lip. L. 0·4. B. 0·25.

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* A diminutive; of *margo*, a rim. † Smooth; properly *levis*.

Var. *oblonga*. Pure white, more elongated, and compressed in front.

HABITAT: Sandy ground, from 12 to 85 f., on every part of our coast, from Guernsey to Unst; local. Laskey gives Dunbar; but his specimen in the British Museum is *M. Maugeriæ*, a tropical species. The variety is Zetlandic. *M. lævis* occurs in the Red and Coralline Crag, and (according to Woodward) in the Norwich Crag also; Pont le Roy, in the Faluns of Touraine (Cailliaud); Vienna basin (Hörnes); Italian and Grecian tertiaries (Brocchi and others). Brittany (Delaunay, *fide* Taslé); Corunna to Gibraltar (M'Andrew); both sides of the Mediterranean, the Adriatic, and Ægean: depths 8–55 f.

The animal is very lively and active, a great beauty, and by no means bashful. When on the march it carries the branchial tube in an upturned position. One pair, having crawled out of the water in a glass jar, coupled for seven or eight hours; their union was cruelly dissolved by immersion in boiling-water. The size of the shell is extremely variable. The outer lip is at first thin and sharp; then it becomes inflected, and has a plain edge; afterwards the lip is thickened and notched.

This is the *Cypræa Voluta* of Montagu, *Voluta cypræola* of Brocchi, and *M. Donovani* of Payraudeau;

the young is probably *Voluta pallida* of Adams (not of Linné), and it agrees with the type in my possession of Turton's *V. fusiformis*.

M. catenata and *M. alba* were erroneously described as British by Colonel Montagu, *M. catenata* on the authority of Swainson and Laskey, and *M. alba* on the unsupported testimony of the last-named witness; both species are common in parcels of West-Indian shells.

Genus II. CYPRÆ'A*, Linné. Pl. VII. f. 4.

Body like that of *Marginella*.

Shell oval, usually smooth and polished: *spire* in most species covered over and concealed when the shell is full-grown: *mouth* narrow, stretching from one end of the shell to the other, and channelled at the top and bottom: *outer lip* folding inwards: *pillar* notched or tuberculated.

Mucianus and Rondelet supposed that this shell-fish was the famous ἐχενηΐς, which is said by Herodotus to have arrested, at the instance of Venus, the course of Periander's ship, and to have thus prevented the execution of his barbarous design with regard to the Corcyrian youths. Hence the name of *Cypræa* or *Concha Venerea*. The ἐχενηΐς of Aristotle was evidently the sea-lamprey or lumpsucker.

The young shell has a prominent spire, like that of *Marginella*, which it resembles in shape also; in the adult or perfect state the spire is covered and usually concealed by successive layers of porcellanous matter, and the shell then exhibits a close affinity to *Ovula*. The outer lip in the earlier state of growth is thin and has a sharp edge; it is subsequently folded inwards and thickened, so as to contract the mouth. Bruguière stated, and Lamarck believed that, as the animal increased in size, it was obliged to leave its shell, in order to make a new and more capacious one. The notion of Sowerby and Reeve, that *Cypræa* can absorb the outer lip and form another, is not less fanciful. Such hypotheses were founded on the circumstance that full-grown shells are often smaller than half-grown specimens; but the difference of size in individuals of the present family offers a simple explanation. In a very curious report by Dr. Brückmann of Brunswick (1722) on the "*Concha Venerea*" and another shell, it is mentioned that, by applying the former closely to the ear, "sie konnten das Meer brausen hören." The embryology of *Cypræa* must be somewhat anomalous; for Mr. A. Adams observed at Singapore some fry, supposed to belong to *C. annulus*, adhering in masses to the mantle of that mollusk, or swimming (some in rapid gyrations, and others with abrupt jerking movements) by means of their head-lobes.

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* More correctly *Cypria*; from Cypris, one of the names of Venus.

Some of the ancient Greeks called this well-known shell χοῖρος, and the Romans *porcus* or *porculus*; the old English name is "gowrie" (now "cowry"), and the French "pucelage" or "pou-de-mer."

While tropical seas are enriched by so many and such beautiful species, our own has but a single puny representative of the genus.

CYPRÆA EUROPÆ'A*, Montagu.

C. Europæa, Mont. Test. Br. (ii.) p. 88; F. & H. iii. p. 495, pl. cxiv. A. f. 6–9, and (animal) pl. NN. f. 5–7.

BODY of various hues, the predominant ones being yellow, brown, and pink; it is sometimes marked with transverse stripes or lines: *mantle* very large, spread (in the adult) over the back or upper part of the shell, which it oftens covers completely; it is more or less studded with conical or wart-like processes, some of which frequently are branched and others longer than the rest; colour pale orange-brown with the papillæ yellow or white, and occasionally variegated by red spots and a few purplish blotches: *pallial tube* conico-cylindrical, rather long, projecting horizontally or somewhat upturned; this is also studded with papillæ, and is orange or light yellowish-brown; edges of the orifice slightly reflexed: *proboscis* long: *tentacles* long, flexible, tapering to a blunt point, and widely diverging; they are speckled with yellow: *eyes* on short stalks at the outer bases of the tentacles: *foot* expansile, so as to be twice the length of the shell, in front truncated, with small angular corners, behind rounded or obtuse-angled; it is pale yellowish-brown, and edged with a rather broad border of a lighter tint; sole whitish, yellow, or orange: *verge* large, orange: *jaws* elliptical and horny: *odontophore* short.

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* European.

Shell roundish-oval, solid, opaque, and glossy: *sculpture*, from 20 to 25 fine thread-like ribs, which cross the back of the shell or body-whorl, and are continued within the mouth; a few of these ribs anastomose, or are shorter and placed between others of full length; those at each end are fork-like; their interstices (especially on the underside of the shell) are microscopically pustulated: *colour* pale reddish-brown or fleshcolour (sometimes whitish) above, often variegated by three purplish-brown spots along the back, one at each end and the third in the middle: the underside of the shell is white; ribs paler in highly coloured specimens: *spire* very short, more or less concealed in the adult; apex of young shells (in which alone it is visible) not unlike that of *Natica*: *whorls*, apparently a single one which enwraps all the others; in the young between 3 and 4 may be counted: *suture* in the early state of growth slight, afterwards coated over: *mouth* slit-like, nearly of the same width throughout, and somewhat arched: *canal* very short and straight, exhibiting on the outside a conspicuous notch: *outer lip* very thick, broad, and rounded; edge notched by the ribs: *inner lip* scarcely perceptible: *pillar* gently curved, angulated or ridged on the outside, with a cavity or depression underneath; inside traversed by the ribs, and notched. L. 0·45. B. 0·35.

Habitat: All our coasts, on stony and coral ground, from low-water mark to 100 f. Dead shells are common on sandy beaches, having been washed up by the tide and waves from the laminarian zone. Fossil in most quaternary and upper tertiary deposits in Europe, as far back as the Coralline Crag and Vienna basin, but not found in the Clyde or other glacial beds. The range of this species, in a recent or living state, extends from Drontheim to Gibraltar, and throughout the Mediterranean, Adriatic, and Ægean; depths 0–100 f.

"It is surprising to see with what facility the expanded animal withdraws itself—foot, mantle, head, and tube—through the narrow opening of the shell" (Clark's MS.). Like *Buccinum undatum* it continually discharges an immense quantity of clear slime. Couch says that it often gets into crab-pots; so that it seems to be fond of all kinds of animal food. The colour and spots appear on the shell when it is half-grown. Northern specimens, whether from shallow or deep water, are almost invariably plain—although I have a spotted one, dredged alive in 86 fathoms. Those from the south are more frequently spotted; but bathymetrical conditions do not seem to affect the colour. Young shells are transparent and ribless. The variation in size is very great. A specimen from Shetland is 5½ lines in length, while another from Guernsey measures barely 2½ lines; the bulk of the former is therefore five times that of the latter. Some are more globular than others; and monstrosities or misshapen forms now and then occur. Spanish and Mediterranean specimens are remarkably small.

According to Lister these pretty playthings of children used to be called "nuns" at Hartlepool: he distinguished ours from the Jamaica shell (*C. pediculus*) by not having a furrow along the back. Linné noticed three geographical varieties of his *C. pediculus,* viz. *Indica, Europæa,* and *Anglica,* the last being without spots. Our species is the *C. arctica,* (Solander) Pulteney, *C. coccinella,* Lamarck, *C. mediterranea* and *C. Europæa,* Risso, and *C. norvegica,* Sars. The half-grown shell is *C. bullata* of Pulteney, and the young (before the outer lip is formed) is *Bulla diaphana* of Montagu and *B. candida* of Macgillivray. Among other provincial names are "John-o'-Groat's buckie" and "sea-cradle." The present species is the type of Gray's genus *Trivia.*

C. pediculus has been erroneously recorded as European by Turton and Collard des Cherres. *C. moneta* (the money-cowry of South Africa) has been picked up on the shore near Bangor, co. Down (Hyndman), in Provence (Martin, *fide* Petit), and at Algiers (Weinkauff); but these cases by no means prove that it inhabits either the Irish sea or the Mediterranean.

Genus III. O'VULA*, Bruguière. Pl. VII. f. 5.

Body oblong: *mantle* pustulated or smooth: *head* furnished with a contractile snout.

Shell forming a complete spindle, glossy, but spirally striated: *spire* very short, perceptible in the young only, and concealed in the adult: *mouth* extending the whole length of the shell, channelled at each end: *outer lip* in some species folded inwards and notched or thickened, in other species prominent and thin: *pillar* smooth.

The difference between a retractile proboscis and a contractile snout is not, in my opinion, so important, taken by itself, as to justify the separation of this genus from the *Cypræidæ.* The passage from *Cypræa* to *Ovula* is very gradual; and these genera are closely allied, as regards both the animal and the shell. The genus

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* From *ovulum,* a little egg.

Simnia of Leach's MS. was founded on the solitary species which our seas produce; the two Mediterranean species assigned to it by Risso (if they are not identical) have the outer lip inflected, with a notched edge; although he describes that genus as having the mouth thin.

OVULA PA'TULA*, Pennant.

Bulla patula, Penn. Br. Zool. iv. p. 117, t. lxx. f. 85 A. *O. patula*, F. & H. iii. p. 498, pl. cxiv.B. f. 1, 2, and (animal) pl. NN. f. 1–4.

BODY yellowish-white tinged with brown: *mantle* smooth, loose about the neck, and having two lateral lobes, which are reflected on the back of the shell, so as at times to cover the whole of it; these lobes are striped transversely with pale red-brown or brownish fine lines, interrupted by small spots or dots: *pallial tube* not extending one-eighth of an inch beyond the canal or beak of the shell [" rather long," F. & H.]: *head* consisting of a rather large and moderately long contractile muzzle (not a proboscis), the mouth being placed at its extremity underneath, with a concave disk which is marked in a star-like fashion with white lines on very fine plates; at the bottom of this disk is a vertical orifice, within which is the buccal mass, containing two strong white semicircular jaws with a short rough lingual riband running between them: *tentacles* rather long and conical, somewhat bluntly pointed; they are white, and their extremities pale brown tipped with white: *eyes* on very large broad stalks (which are considerably raised) on the external angles of the tentacles: *foot* very large, exceeding the limits of the shell [" scarcely broader than the shell," F. & H.]; it is truncated or subangular in front [" its frontal angles are rounded," F. & H.], marked lengthwise with intensely flake-white lines, which, when the animal is at rest or not fully extended, corrugate into distinct folds or plaits, and the front margin of the foot then seems notched; it expands considerably beyond the right side of the shell, and tapers behind, terminating in a sharpish [" obtuse," F. & H.] point, much beyond the posterior part of the shell; sole grooved down the middle: *gills* coarsely pectinated, forming a single plume: *verge* large and flat, curved, and ending in a point. (Clark, MS.)

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* Open.

Shell forming a short spindle, thin, semitransparent, and glossy: *sculpture*, minute, delicate, and rather close-set spiral striæ, which are more conspicuous at the extremities and in young shells; they are somewhat wavy, and slightly reticulated by microscopic lines of growth: *colour* pale yellowish-white, sometimes orange, and occasionally tinged with pink: *spire* excentric, visible only in young shells, extremely short, lying within the level of the upper canal; it exhibits under a strong magnifying-power a finely punctured appearance, like the apex of *Rissoa Jeffreysi*: *whorls*, apparently a single tumid one which envelopes all the rest; in the young may be counted 3 convex whorls, the first of which is blunt and mammiform: *suture* in the early state of growth slight, afterwards covered over: *mouth* large and wide, somewhat expanding, of an irregular shape in consequence of the periphery projecting into it; it is narrower above than below: *upper canal* semitubular, expanding outwards, and having the inner side or wall more or less twisted, thickened, and white: *lower canal* very short and broad, usually straight; notch obliquely but not deeply incurved: *outer lip* flexuous; edge plain and prominent, now and then thickened within: *pillar* excavated or indented, and girded by a twisted ridge. L. 1. B. 0·5.

Habitat: Coralline zone, on the coasts of Dorset, Devon, and Cornwall; Guernsey (J. G. J.); co. Galway (Barlee); Macgilligan, co. Londonderry (Mrs. R. A. Hyndman, *fide* Thompson); Turbot bank, co. Antrim (Waller); Sound of Mull (Bedford). Mr. Horace Marryat found it living among tufts of *Tubularia indivisa*, in the Gouliot caves at Sark, at low water. Laskey gives "Porto-bello sands;" but such a locality seems improbable. M. Martin has taken this species in the Gulf of Lyons, regarding it as the young of *O. carnea* (*Bulla carnea*, Gmelin), of which the *O. Adriatica* of Sowerby is perhaps a variety.

If the present species should prove to be also a variety of *O. carnea* (which differs only in its outer lip being inflected and the edge notched), Pennant's name *patula* has the precedence. Our shell varies in thinness, in comparative length and breadth, and in the turgidity of the body-whorl. *O. carnea* is not uncommon in the Mediterranean; the young is probably Risso's *Simnia nicæensis.*

Order IV. PLEUROBRANCHIATA, Gray.

(See Vol. III. p. 200.)

In the same year that Dr. Gray proposed the name which I have adopted for this order, Professor Lovén published another name, viz. Pomatobranchia. I now place it immediately after the Siphonobranchiata, and postpone the Pulmonobranchiata (as being more perfect Gastropods) not only to the present order, but also to the Nudibranchiata and Pellibranchiata. I accidentally omitted in page 265 "Order III. SIPHONOBRANCHIATA." The families *Cerithiopsidæ* to *Cypræidæ* inclusive belong to the last-named order; and the numbers prefixed to them (viz. XXVI. to XXXI.) ought therefore to be I. to VI.

Family I. BUL'LIDÆ, (*Bulladæ*) Clark.

Body gelatinous, generally divided into separate parts or lobes, and not always containable within the shell: *head* snout-shaped: *tentacles* either united and forming a hood or head-veil, or consisting of two distinct and broad lappets: *eyes*, when present, sessile or subcutaneous, at the base of the tentacles or at the sides of the head: *foot* usually large, sometimes expanded on each side, like fins (*epipodia*) which serve for swimming, as well as behind into a single lobe (*metapodium*), so as to cover the crown or apex of the shell: *gills* forming a single triangular plume, which is placed across the back on the right side, and protected by the shell: *gizzard* peculiar to most (if not all) genera, and composed of several (usually three) calcareous or horny plates. Both sexes common to each individual.

SHELL convolute, external or internal: *epidermis* thin: *spire* mostly short, frequently truncated or concealed: *mouth* extending the whole length of the shell, or the greater part of it; it is entire (*i. e.* not channelled) at the base: *outer lip* having a prominent and sharp edge: *operculum* very seldom present.

As to the characters founded on the tongue, Lovén says, "Typus armaturæ lingualis vagus:" this is not a strong recommendation of the odontological system. The structure and anatomy of *Bulla, Scaphander,* and *Philine* have been admirably investigated by Cuvier; he first showed the affinity of the last-named genus to *Aplysia.* Some of the *Bullidæ* are zoophagous, others feed indifferently on fresh or decayed animal matter. The former swallow their prey (which chiefly consists of other mollusca) entire; and the calcareous plates of the gizzard, moved by muscles of great strength, serve to crush the most solid shells. This family does not appear to be ancient. According to Mr. Searles Wood a species of *Bulla* has been found in the Cornbrash, and another in the Wealden formation. Many are tertiary; and the existing members of this group have a very wide geographical and bathymetrical range. Most of them are truly marine, while a few prefer brackish water; all live in sand and ooze or in

> . . . . "the slimy bottom of the deep."

Bonanni and Gualtieri called the present family "nux marina," D'Argenville "gondole," and Pennant "dipper." It is the *Bullæina* of Macgillivray.

Genus I. CYLICH'NA*, Lovén. Pl. VIII. f. 1.

BODY containable within the shell: *mantle* thickened at the edge: *head* depressed: *tentacles* united with the head, and forming together an elongated and right-angled disk, which is recumbent on the front of the shell: *eyes* none (?): *foot* very long, expansile behind: *gizzard* calcareous.

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* A medicine-box.

Shell altogether external, and cylindrical; spire concealed: *mouth* extending the whole length of the shell, contracted above and widening below: *pillar* furnished with a more or less obscure fold: *operculum* none.

Lovén included in this genus several species of *Utriculus*. *Cylindrella*, Swainson, has priority of publication; but that author gave the same name to a genus of *Conidæ*, and Pfeiffer also applied it to a genus of *Helicidæ*: the latter application has been confirmed by general usage.

1. Cylichna acumina'ta*, Bruguière.

Bulla acuminata, Brug. in Enc. Méth. (Vers) t. vi. p. 376. no. 9. *Ovula ? acuminata*, F. & H. iii. p. 500, pl. cxiv. b. f. 3, as *O. acuminata*.

Shell regularly spindle-shaped, or forming an elongated oval which is pointed above and broad below; it is thin, almost transparent, and glossy: *sculpture*, slight spiral striæ at each end, and very faint microscopic lines in the same direction on the intermediate space; the striæ near the apex are fewer and more remote than those near the base: *epidermis* inconspicuous: *colour* clear white: *mouth* very long, commencing at the top in a short and slightly recurved spike, and gradually widening towards the base, where it is expanded and rounded: *outer lip* flexuous, with a sharp edge: *inner lip* consisting of a mere film on the upper part and in the middle, but thickened and reflected at the base, so as to give the pillar the appearance of having a short fold: *pillar* twisted, and bending a little to the left. L. 0·15. B. 0·075.

Habitat: Muddy sand in the coralline zone, on the coasts of Cornwall (M'Andrew, Barlee, and Hockin); Plymouth among trawl-refuse, and dredged off the Arran Isles in co. Galway (Barlee); south of Ireland (M'Andrew); co. Antrim, 25 f. (Hyndman and Waller);

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* Pointed.

Loch Fyne and west of Scotland (Barlee, Alder, and J. G. J.); Banff (Edward, *fide* Gordon); Aberdeenshire (Dawson); Wick (Peach); Shetland (Barlee and J. G. J.). It is somewhat rare. Coralline Crag at Sutton (Wood); black or lower Crag at Antwerp (Nyst); Dax (Grateloup); Italian tertiaries (Soldani, Brocchi, Cantraine, Philippi, and Calcara). Inhabiting the coast of Norway (Danielssen, 40 f., and Lilljeborg); Sweden (Lovén, and Malm who found this species and *Mytilus Adriaticus* living together in 12 f.); Gibraltar, 20 f. (M'Andrew); both sides of the Mediterranean, in many places, at depths of from 20 to 35 f. (Plancus and others); Adriatic (Chiereghini, v. Schröckinger, and Brusina); Ægean, 40 f. (Forbes).

Lovén has examined the animal, and ascertained that it is undoubtedly a *Cylichna*. The shell differs generically from *Ovula* in the mouth not being channelled or open at the upper end.

It appears to be the type of De Montfort's genus *Rhizorus*, founded on the *Nux marina minuscula* of Soldani, and named by the former *R. Adelaïdis*. According to Nardo it is the *Bulla fucicola* of Chiereghini. Not *B. acuminata* of the 'Mineral Conchology,' which is a Barton fossil.

2. C. NITI'DULA*, Lovén.

C. nitidula. Lov. Ind. Moll. Scand. p. 10; F. & H. iii. p. 515, pl. cxiv. c. f. 6.

BODY clear white.

SHELL oblong and somewhat elongated, attenuated behind or towards the top, thin, semitransparent, glossy and slightly iridescent: *sculpture* none, even under the microscope; lines of growth extremely slight, forming wrinkles towards the top: *epidermis* inconspicuous: *colour* clear white: *mouth* narrow above and in the middle, and wide at the base, where it is expanded and rounded: *outer lip* gently curved; the upper part projects beyond the apex or crown; this latter part is considerably contracted, and encircled by a solid rim, and it exhibits a very small opening through which part of the involute spire is indistinctly visible: *inner lip* usually slight, but thickened in older specimens, a little reflected below: *pillar* short, and furnished with a small slight tooth-like fold near the base; it is somewhat curved to the left. L. 0·125. B. 0·06.

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* Rather glossy.

HABITAT: On the same kind of sea-bottom as the last species, in 30–50 f., Loch Fyne and the west coast of Scotland (Barlee and J. G. J.); off Larne, co. Antrim, and outside the Dogger bank (J. G. J.); Berwick Bay (Johnston, as *Bulla umbilicata*); Banff (Edward, *fide* Gordon); Aberdeenshire coast (Dawson); Shetland (Barlee and J. G. J.). It is more local than rare. Danielssen records this species as Norwegian, and Lovén, Malm, and Lilljeborg from the south of Sweden: depths 12–40 f.

3. C. UMBILICA'TA*, Montagu.

Bulla umbilicata, Mont. Test. Br. (i.) p. 222, t. 7. f. 4. *C. umbilicata*, F. & H. iii. p. 519, pl. cxiv. c. f. 8, 9.

SHELL oblong, not so much attenuated behind as the last species, more solid, nearly opaque, and glossy but not prismatic: *sculpture*, slight and sometimes wavy spiral striæ or impressed lines, which vary in strength and remoteness on the body, and are more or less close-set near the base; they are visible in fresh specimens by means of a low magnifying-power, but are not easily observable in rubbed specimens picked out of drift sand: *epidermis* brownish-yellow, liable to peel off: *colour* creamy, becoming bleached and white in dead shells: *mouth* somewhat open at the top, contracted and narrow in the middle, pear-shaped and wide at the base, where it is expanded and rounded: *outer lip* gently curved; the upper part is obliquely truncated, but it does not project so far beyond the apex or crown as in the last species: *apex* twisted and somewhat contracted, encircled by a solid white rim (*periomphalus*, Lovén), and exhibiting a perforation in the centre, like that of *C. nitidula*: *inner lip* as in the last species: *pillar* short and thick, furnished with a rather strong tooth-like fold near the base; it has a sharp curve to the left. L. 0·125. B. 0·065.

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* Umbilicate, or provided with a navel.

Var. *conulus*. Larger, narrower at the apex, and conical; the upper angle of the outer lip is higher and more projecting. *Bulla conulus*, S. Wood. Crag Moll. pt. i. p. 173, pl. 21. f. 2 a–c. *C. conulus*, F. & H. iii. p. 517, pl. cxiv. c. f. 7.

HABITAT: With *C. nitidula* in the north, and southwards to Cornwall, as well as on our eastern and western coasts, and in Ireland; local, but extensively diffused. Of the variety a single specimen only has occurred, and was dredged by me in Deal Voe, Shetland, at a depth of about 10 f.; it is not uncommon in the Coralline Crag at Sutton (Wood), and in the Belgian tertiaries (Nyst). The typical form is fossil in a post-glacial deposit at Skien in Norway, 100 feet (Sars); Bordeaux and Asti (Cantraine); and Italian tertiaries (Brocchi and others). The geographical range of this species is considerable, comprising the Scandinavian coast, from the Loffoden Isles (Sars) to Bohuslän (Lovén and Malm), the oceanic shores of France (Récluz, Taslé, and Cailliaud), Vigo Bay and Gibraltar (M'Andrew), both sides of the Mediterranean (Cantraine and others), the Adriatic (Brusina), and Ægean (Forbes); depths 4–50 f. Weinkauff gives the variety *conulus* as common at the entrance of and inside the harbour of Algiers, in from 10 to 20 f.

Differs from *C. nitidula* in being somewhat broader in proportion to its length, and not so much attenuated behind, being spirally striated instead of smooth, having frequently a conspicuous epidermis, in the upper angle of the outer lip not being so prominent, the apical perforation being larger, and the columellar fold more distinct.

This appears to be the *Bulla Blainvilliana* of Récluz, and *Volvaria subcylindrica* of Brown. The *C. strigella* of Lovén was founded on fresh specimens of the present species, having the striæ more distinct than usual. I do not regard the variety as the *Bulla conulus* of Deshayes (an Eocene and Miocene species), which is represented as much narrower at the top and wider at the bottom, with the apex abruptly truncated, and the spiral striæ more remote.

4. C. CYLINDRA'CEA*, Pennant.

Bulla cylindracea, Penn. Br. Zool. iv. p. 117, t. lxx. f. 85. *C. cylindracea*, F. & H. iii. p. 508, pl. cxiv. B. f. 6, and (animal) pl. VV. f. 3.

Body milk-white, pale strawcolour, or dirty white with a faint tinge of yellowish-brown: [" *mantle* not thick, rarely produced beyond the front and lateral margins of the shell; it is edged with a series of minute red papillæ" (Clark):] *head* snout-like, broad, wrinkled across, and truncated or slightly cloven in front: *tentacles* united with the head, and forming a kind of hood, which folds back over the front of the shell, and is indistinctly bilobed above: *eyes*, none that Mr. Clark, Mr. Alder, or myself could detect, although I carefully examined many specimens for that purpose; but Forbes and Hanley say, after describing the tentacles, "some way in front of their bases are two very minute and obscure eyes:" *foot* rather short, assuming various shapes, being sometimes triangular and at other times square, oval, or oblong, occasionally semicylindrical and wedge-shaped in front, where it meets the edge of the snout or head-flap; it is slightly folded up at the sides, and usually broader behind, which part is furnished with two angular points: *verge* small, conical, and hyaline: *gizzard* composed of three minute shelly plates, imbedded in a muscular mass; these are semicylindrical and narrow.

Shell forming a long cylinder of nearly the same breadth throughout, solid, opaque, and rather glossy: *sculpture*, numerous fine and wavy spiral striæ, which are visible in fresh specimens by the aid of an ordinary lens, but being slight easily disappear: *epidermis* brownish-yellow, darker at the base: *colour* white under the epidermis, and having a bluish or slaty tinge in worn specimens: *mouth* narrow and of equal width in the upper and middle portions, pear-shaped and very wide at the base, which is rounded although somewhat truncated: *outer lip* nearly straight in the middle, with a curved slope at each end; the outer corner at the top is bluntly rectangular, and not prominent; inner corner obliquely incurved: *apex* twisted and slightly contracted, obliquely truncated, encircled by a solid white rim or keel, and concave in the centre; perforation small and indistinct: *inner lip* conspicuous, sometimes thickened, and partly folded over the apex: *pillar* short, curved or somewhat twisted, and having a broad fold at the base; it abruptly turns to the left. L. 0·6. B. 0·2.

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* Meaning cylindrical, but not a classical word.

Var. *linearis*. Shell somewhat shorter, nearly smooth and decidedly glossy, marked at each end with yellowish-brown spiral lines, which are few and remote at the top, and close-set at the bottom; apex invariably perforated and exhibiting part of the internal spire.

Monstr. Base irregularly cup-shaped, with the edge reflected.

HABITAT: Muddy sand in the coralline zone, on all our coasts, from Guernsey to Unst; rather common. I obtained the variety in Loch Fyne and Shetland; it may be specifically distinct. The monstrosity is from Tenby. This species occurs in the Clyde beds (Smith); Red and Coralline Crag (Wood); Antwerp crag (Nyst); French tertiaries (Grateloup and Mayer); Nice (Risso); Italian tertiaries (Brocchi and others); Vienna basin (Hörnes); Rhodes (Hedenborg, *fide* Hörnes). Its diffusion, as recent, extends from Vadsö in East Finmark (Danielssen) to Madeira and the Canaries (M'Andrew), and throughout the Mediterranean (Risso and others), Adriatic (Brocchi and Cantraine), and Ægean (Forbes); depths recorded 3–160 f.

Its habits are sluggish; and its progress is painfully slow, although by means of its foot it can crawl up the side of a glass vessel. When irritated it emits a saffron-coloured liquid. The head and the front of the foot, being of the same length, make a broad wedge, which probably serves for probing the muddy sand in quest of prey, like the snout of a pig grubbing for earthworms. The apex of specimens from tenacious mud in Loch Fyne and Shetland is coated with a thick and prominent crust, having the appearance of a blunt spire; this may be owing to an accumulation in that part of fæces and slime mixed with fine sand and mud, which had been trailed along in the progress of the animal.

It is the *Bulla Oliva* of Gmelin, *B. cylindrica* of Bruguière, Pulteney, and Donovan (not of Chemnitz), *B. convoluta* of Brocchi, and *Cylindrella alba* of Swainson; the young is the *Bulla producta* of Brown, and *Bullina producta* of Macgillivray. The *Bulla cylindracea* of Da Costa is *Marginella pallida*, a common West-Indian shell.

5. C. ALBA*, Brown.

Volvaria alba, Brown, Ill. Conch. G. B. & I. p. 3, pl. xix. f. 43–44.

BODY clear white, with a faint tinge of fleshcolour on the upper part: *mantle* thick, extending as a prominent fold or process at each extremity of the shell: *head* thick, bilobed in front: *tentacles* forming an entire and rather short disk in extension or continuation of the head, and folded back over the front of the shell: *eyes*, none perceptible: *foot* lozenge-shaped, short, bluntly rounded in front, and opposed to the head (so as to make together a blunt wedge), expanded and rounded behind, with an angular lobe on each side in that part: [*odontophore*, rhachis small, compressed, erect, broader above, with the cutting-point slightly produced and jagged; uncini 6, the first by far the largest and having the base extended on each side, with the cutting-point strong, bent inwards, and jagged or notched on the inner side, the others minute and shaped like curved claws (Lovén):] *gizzard* like that of *C. cylindracea*; but the plates in the present species are oblong, thicker, gibbous (instead of rounded) on the upper side, with a boss in the centre, and more convex beneath.

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* White.

Shell forming a short cylinder, or oblong, broader in the middle, and less solid than in the last species, semitransparent, and decidedly glossy: *sculpture,* numerous and close-set but extremely fine and slight spiral striæ, which can only be detected by the aid of a strong magnifier: *epidermis,* a pellucid creamy film: *colour* white: *mouth* more open than in *C. cylindracea,* although having the same shape: *outer lip* gently curved throughout; it is higher at the top than in the last species, and at the outer corner it recedes or slopes more abruptly; inner corner obliquely incurved: *apex* twisted (not contracted); it is encircled by a strong and angulated rim, and concave in the centre, with a minute perforation in some specimens: *inner lip* forming at the upper end a thick fold, which is reflected on the apex and usually covers the perforation; it is conspicuous, but thin, in other parts: *pillar* short, broad, curved and twisted to the left, with an obscure plait. L. 0·35. B. 0·175.

Habitat: Fine sand, in 84–95 f., about 25 miles N.N.W. of Unst, with *Limopsis aurita* and other rare mollusca. It is one of our post-glacial fossils, and has been found at Greenock (Stewart Kerr, *fide* Brown), Paisley and Lochgilphead (Crosskey), Dalmuir (Robertson), and Annochie in Aberdeenshire (Jamieson); Mammaliferous Crag near Norwich (Witham, *fide* S. Wood as *Bulla cylindracea,* var. *monstrosa*); Norway 2–40 feet (Sars). Its existing range is arctic and high northern, and comprises Norway, Iceland, Spitsbergen, Greenland, and North-east America; west coast of North America (P. Carpenter): depths 10–160 f. The most southern limit appears to be Bergen.

This lives with *C. cylindracea*; and its movements are equally slow. In one Norwegian specimen the colour of the epidermis is brownish-yellow, as in the other species. I have figured the tongue, from a drawing kindly made for me by my late friend Mr. Alder.

It is the *Bulla triticea* of Couthouy, and *B. corticata* (Beck) of Möller.

C. striata (*Bulla striata*, Brown) = *B. insculpta*, Totten = *B. Reinhardi*, (Holböll) Möller = *C. propinqua*, Sars, is one of the Clyde-bed fossils; but it does not now exist in our seas. The late Mr. Thompson of Belfast erroneously noticed this arctic species as found at Bangor, co. Down, by Mr. Hyndman. It inhabits the eastern coasts of North America, Greenland, and Finmark.

Genus II. UTRI′CULUS*, Brown. Pl. VIII. f. 2.

Body containable within the shell: *mantle* slightly thickened at the edges: *head* broad: *tentacles* separate and triangular: *eyes* minute, placed at the base of the tentacles: *foot* oblong or oval, shorter than the shell, more or less divided or bilobed behind: [*odontophore*, according to Lovén's description of that organ in his *Amphisphyra globosa*, having the rhachis broad and nearly rectangular, with the cutting-point transverse and jagged; the uncinus is single, claw-shaped, slender, expanded at the base, and winged outside:] *gizzard* small, horny.

Shell altogether external, forming a short cylinder, or globular: *spire* exposed, mostly truncated: *whorls* angulated or keeled, the first being nipple-shaped: *mouth* usually extending the whole length of the shell, narrow at the upper part, and expanding in front: *pillar* furnished at the base with a small fold or plait: *operculum* none.

This genus differs from *Cylichna* in the tentacles being separate, eyes distinct, gizzard horny, and the shell having a visible spire with a mammillar apex. It is the *Bullina* of Risso and De Blainville, and perhaps of Férussac also; but that name has been appropriated to another genus allied to *Aplustrum*. I regard *Amphisphyra* of Lovén as a synonym of the present genus. Brown had many years previously proposed the objectionable name *Diaphana*; but he afterwards cancelled or discarded it in favour of *Utriculus,* which has also precedence of *Amphisphyra.*

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* A husk of grain.

A. Shell cylindrical or oblong, and solid.

1. Utriculus mammilla'tus*, Philippi.

Bulla mammillata, Phil. Moll. Sic. i. p. 122, t. vii. f. 20. *Cylichna mammillata,* F. & H. iii. p. 514, pl. cxiv. c. f. 4. 5.

Shell forming a short cylinder, somewhat constricted in the middle, and having the same breadth at each end; it is semitransparent and glossy: *sculpture,* minute and rather slight striæ, which vary in number and contiguity, and in fresh specimens examined under a microscope appear delicately and closely punctate: *epidermis* inconspicuous: *colour* clear white: *spire* truncated, and encircled by a narrow and solid rim; it is sunk below the level of the apical rim or periomphalus: *whorls* 2–3; the last (as usual in this genus) envelopes all the rest; the penultimate whorl exhibits the outside rim only; the innermost is globular, prominent, and turned inwards or inflected, but not reversed: *suture* deep: *mouth* narrow above, more contracted in the middle, pear-shaped and wide at the base, which is rounded: *outer lip* flexuous, curved and folded inwards in the middle; the upper part projects a little beyond the apex; outer corner rounded; inner corner receding and incurved, so as to make the suture transversely excavated in front: *inner lip* continuous with the outer lip above, where it is slightly folded on the apex, as well as on the pillar below: *pillar* short, flattened, and curved: *fold* indistinct. L. 0·1. B. 0·05.

Habitat: Laminarian and coralline zones in the Channel Isles, Devon, and Cornwall; co. Galway (Barlee); Turbot bank, co. Antrim (Waller); Hebrides and west coast of Scotland (J. G. J. and others); Dunbar (Brown); Aberdeenshire (Macgillivray and Dawson); Shetland (Barlee and J. G. J.). Fossil at Dalmuir (Crosskey); post-glacial beds in Norway, 30–50 feet (Sars); Bordeaux (Cantraine); Sicily (Philippi and Calcara). Recent: Grip, Finmark, in the stomach of an *Astropecten Mülleri,* and southwards to Christiansund (Sars); Norway (Lilljeborg); Bohuslän, with *Mytilus Adriaticus* (Malm); Loire-Inférieure (Cailliaud); Orotava in the Canaries (M'Andrew); Mediterranean, from the Gulf of Lyons (Martin) to Sicily (Philippi); Algiers (Weinkauff); Adriatic (von Schröckinger and Brusina); Ægean (Forbes): depths 7 to 60 f.

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* Furnished with a nipple; not a classical word.

It is the *Bulla striatula* (sec. typ. in mus. Brit.) of Forbes, *B. minuta* of Macgillivray, and *B. truncatula* of myself.

2. U. TRUNCA'TULUS*, Bruguière.

Bulla truncatula, Brug. in Enc. Méth. (Vers) t. vi. p. 377. no. 10. *Cylichna truncata*, F. & H. iii. p. 510, pl. cxiv. B. f. 7, 8, and (animal) pl. VV. f. 4.

BODY nearly clear white, with often a tinge of brownish-yellow on the upper part, and minutely frosted: *mantle* lining the mouth of the shell, and forming an excretal canal at the posterior extremity: *head* squarish, depressed, cloven and slightly advanced in front of the foot: *tentacles* large, flat, triangular and rather long, with pointed tips, usually folded or curling back towards the front of the shell ["lying like the ears of a hare close to each side of the neck" (Clark)], but carried nearly erect when the animal is crawling: *eyes* very small and round, apparently sunk within the outer integument, placed rather close together in the middle between the head and tentacles: *foot* oblong, indented in front, and rounded or occasionally nicked behind ["this organ is at times considerably reflected laterally on itself and the front of the shell, and, when the animal is quiescent, assuming a quadrilobate form" (Clark's MS.)]: *gizzard* cartilaginous, enclosing three oval corneous yellowish-brown plates, which are studded with squarish black tubercles of different sizes.

SHELL forming a conical cylinder, narrow on the upper half, more or less deeply constricted in the middle, and expanding on the lower half; it is nearly opaque, and glossy: *sculpture,* numerous longitudinal striæ or fluted ribs on the upper half;

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* Truncated; diminutive.

these are often sharp at the apex, not so distinct in the middle of the shell, and usually disappear towards the base, where they are replaced by lines of growth; the spire is frequently striated across, like an Ammonite: *epidermis* filmy: *colour* white: *spire* involute, abruptly truncated, and encircled by a narrow and solid rim or rounded keel: *whorls* 3–4, gradually decreasing in size towards the centre of the apex; the first or innermost whorl is globular: *suture* deep: *mouth* narrow for more than half its length on the upper part, pear-shaped and very wide at the base, which is rounded: *outer lip* gently curved, and folded inwards in the middle; the upper part projects (sometimes considerably) beyond the apex; outer corner rounded; inner corner receding and obliquely incurved: *inner lip* slight, continuous with the outer lip above, where it is folded a little over the apex, as well as over the pillar, behind which it forms a small and narrow umbilical chink: *pillar* short, thick, and flattened: *fold* tooth-like and strong. L. 0·175. B. 0·075.

Var. *pellucida*. Smaller, shorter, thinner, more transparent. and less strongly ribbed (sometimes quite smooth); epidermis slightly prismatic. *Volvaria pellucida*, Brown, Ill. p. 4, pl. xix. f. 45, 46.

Habitat: Everywhere (chiefly in the laminarian zone) on muddy ground and at the base of seaweeds, from low-water mark to 15 f. The variety appears to be northern, having been noticed by Brown from Dunbar, and found at Aberdeen by Macgillivray, and in Shetland by myself. This species occurs in the Coralline Crag (Wood); post-glacial beds, Norway, 0–100 feet (Sars); Courtagnon (Bruguière); Italian tertiaries (Brocchi and others); Vienna basin (Hörnes). It ranges from Öxfjord in Finmark (Sars) to the Canary Isles (M'Andrew), and throughout the Mediterranean, Adriatic, and Ægean; depths 4–100 f.

Rather active and fond of floating with its shell downwards. Professor Lovén having informed me that it possesses an operculum, I carefully dissected and examined several live specimens, but I could not detect any. Those from Kiel Bay, which Dr. H. A. Meyer kindly gave me, when I looked over his collection at Hamburg, have a brownish-yellow epidermis.

Walker described it as *Bulla crassa*, &c., Adams as *B. truncata* (nine years after Bruguière's publication), Maton and Rackett as *B. retusa*, Schröter (according to Menke's Synopsis) as *B. ieverensis*, Scacchi (according to Philippi) as *B. cylindrica*, Chiereghini (according to Nardo) as *B. cylindracea*, Philippi as *B. semisulcata*, and Brusina apparently as *Cylichna leptoeneilema*. The *B. truncata* of Gmelin is a different species.

3. U. OBTU'SUS*, Montagu.

Bulla obtusa, Mont. Test. Br. (i.) p. 223, t. 7. f. 3. *Cylichna obtusa*, F. & H. iii. p. 512, pl. cxiv. c. f. 1–3.

BODY whitish: *head* remarkably short: *tentacles* placed laterally and standing up like ears, rounded above, and not terminating in points like those of *U. truncatulus*: *eyes* not perceptible. (Alder.)

SHELL forming an oblong cylinder, constricted in the middle, and becoming broader towards the base; it is usually opaque, and rather glossy: *sculpture*, numerous slight lines of growth; and in young and fresh shells may be sometimes detected under the microscope extremely close-set and fine wavy spiral lines; spire indistinctly striated across: *epidermis* skin-like, cream-colour passing into brownish-yellow: *colour* white: *spire* short, but very variable in that respect, being in some cases almost truncated, while in others it is more or less extended: *whorls* 4, slightly angulated at the top; those in the middle gradually enlarge; the apical or central whorl is globular and turned inwards: *suture* deep and narrowly excavated: *mouth* flexuous; upper half narrow; lower half wide, with a rounded base: *outer lip* gently curved, never extending to the apex; it recedes above, so as to leave a space between the outermost whorl and the next, and is contracted and inflected in the middle; outer corner rounded; inner corner obliquely incurved: *inner lip* thicker than in the last species, continuous with the outer lip above; it is reflected over the pillar, behind which it occasionally forms a small umbilical chink: *pillar* broad, flattened, and curved: *fold* obscure. L. 0·225. B. 0·115.

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* Blunt.

Var. *Lajonkaireana.* Smaller and proportionally narrower, with the spire more produced. *Bulla Lajonkaireana*, Basterot, Mém. géol. Bord. (1825) p. 22, t. 1. f. 25.

HABITAT: Muddy estuaries (such as those of the Solent, Thames, Wash, Humber, Mersey and Dee, Solway Firth, Severn, Shannon, Belfast Lough, Loch Fyne, and the Firths of Clyde and Forth), and in brackish water on many other parts of our coast from Jersey to Unst; gregarious at low-water mark, and ranging thence to 15 f. The variety inhabits deeper water in the open sea, off the Channel and Shetland Isles (20–85 f., J. G. J.); it has a wide distribution, as fossil, from our Coralline Crag (Wood) to the Vienna basin (Hörnes). The typical form is recorded from the Mammalian Crag at Bramerton (Wood), and has been found by the Rev. H. W. Crosskey at Dalmuir and Oban. Its extra-British habitat, as recent, appears to be limited, and comprises Iceland (Torell), Denmark (mus. Copenh.), Holland (Menke), Normandy (Macé), Loire-Inférieure (Cailliaud), Bay of Biscay (D'Orbigny père and Fischer), from Massachusetts Bay southwards to New England (Gould and Stimpson, as *Bulla obstricta*), and probably Greenland (Möller, as *B. turrita*).

Mr. Bretherton says ('Zoologist,' p. 6236) that it feeds on *Hydrobiæ* (which abound on the sand-banks where the present mollusk is found), and that it lives in sand, slowly moving about with the head-disk and fore part of the shell buried, and leaving a very distinct trail. It is to be regretted that this gentleman did not describe the animal. I have given a figure of it from a drawing by Mr. Alder. Judging from the contents of the stomachs of mullets caught in Lough Larne, that fish must commit as great ravages among the *Utriculi* as the latter are said to do with regard to the *Hydrobiæ*.

This is the *Voluta alba* &c. of Walker, *Bulla Regulbiensis* of Adams on the Microscope, *B. minuta* of Woodward, and the *U. plicatus* and *U. discors* of Brown; the fry is apparently *B. denticulata* of Adams. The second of these names, although prior to that given by Montagu, is local and obsolete.

B. Shell globular or oval, and thin.

4. U. VENTRO′SUS*, Jeffreys.

Amphisphyra globosa, Jeffr. in Ann. & Mag. N. H. 3rd ser. i. p. 47, pl. ii. f. 6 (not *A. globosa* of Lovén).

SHELL globosely ear-shaped (not unlike a *Velutina*), nearly transparent, glossy, and slightly prismatic: *sculpture*, numerous fine, curved, minute longitudinal striæ, which are very close-set on the upper edge of the body-whorl; these striæ are crossed by a few indistinct spiral lines, but not so as to make the surface reticulated: *epidermis* inconspicuous: *colour* whitish, with a faint tinge of reddish-brown near the outer lip: *spire* small, truncated, and flat: *whorls* 3, slightly angulated at the top; the last is disproportionately large, and the first or central whorl is oval and intorted: *suture* very deep and channelled: *mouth* expanded, nearly oval, contracted above by the projection of the periphery; base even and curved: *outer lip* semicircular; the upper part is on a level with the spire; outer corner rounded; inner corner not receding, nor incurved, as in the last species (but my solitary specimen is imperfect in this part): *inner lip* forming a whitish film, which is spread over the upper part of the underside; it is folded over the pillar, behind which it forms a narrow umbilical groove: *pillar* slight and curved: *fold* obscure. L. 0·125. B. 0·1.

HABITAT: Mr. Barlee procured a single specimen by dredging off Glenelg in Skye; this is now in my collection. I tried the same ground with Mr. Norman last year, in the hope of confirming the discovery; but we were unsuccessful.

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* Bellying out.

Its nearest ally appears to be the *Amphisphyra globosa* of Lovén (a Scandinavian species): our shell, however, is ear-shaped, instead of globosely oval, the spire is proportionally broader, the mouth much wider, and the sculpture peculiar, *U. globosus* exhibiting only the lines of growth.

5. U. EXPAN'SUS*, Jeffreys.

Amphisphyra expansa, Jeffr. in Rep. Brit. Assoc. 1864, p. 330.

BODY gelatinous, clear white, sprinkled all over with minute black specks: *head* or snout broad, bilobed in front: *tentacles* large, triangular or ear-shaped, expanding sideways: *eyes* none: *foot* oval, cloven in front, widely, deeply, and evenly forked behind: *ovary* yellowish-brown.

SHELL barrel-shaped, narrower at the top, dilated and somewhat angular at the sides, and expanding towards the base: it is nearly transparent, glossy, and slightly prismatic: *sculpture* apparently none; but under the microscope may be seen a few slight and indistinct spiral lines and a frosted appearance: *epidermis* inconspicuous: *colour* whitish, except the nucleus or embryonic whorl, which is brownish-yellow: *spire* abruptly truncated: *whorls* 3–4, compact, and angulated at the top; the first is oval, twisted inwards, and slightly projects beyond the rest: *suture* deep and channelled: *mouth* pear-shaped, not extending to the spire; base expanded and rounded: *outer lip* flexuous; outer corner bluntly angular; inner corner receding and incurved: *inner lip* folded over the pillar, wanting on the upper part: *pillar* nearly straight above, and curved below: *fold* obscure: *umbilicus* narrow and groove-like, but well defined by the flexure of the inner lip. L. 0·225. B. 0·175.

HABITAT: Muddy sand in 43 f. near Fetlar Island, and in 82 f. between 40 and 50 miles S.S.E. of the Whalsey or Out Skerries, both localities being in Shetland; rare. Professor Sars informs me that in 1865 his son dredged this species off the Loffoden Isles.

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* Spread out.

This little creature is bold, and crawls rapidly. The absence of eyes is a remarkable character; and there can be no question of the fact, so far as the best optical instruments, long and patient examination under the most favourable circumstances, and the concurrent testimony of three practised observers (Mr. Waller, Mr. Peach, and myself) can establish it. Living specimens of *U. expansus* and *U. hyalinus* were placed side by side, and fully displayed themselves. The latter had distinct eyes at the base of the tentacles, outside the shell. The other, which was three times as large and equally exposed to view, showed no trace of eyes anywhere, although it was carefully examined in every position, in order to detect them. They could not have been subcutaneous; because the tissues of the animal were almost transparent, and I used a high microscopic power, by means of which the internal structure was clearly seen. Similar anomalies in respect of these so-called visual organs occur in the genera *Eulima, Natica,* and *Pleurotoma* among our native mollusks.

6. U. HYA'LINUS*, Turton.

Bulla hyalina, Turt. in Mag. N. H. vii. p. 353. *Amphisphyra hyalina*, F. & H. iii. p. 521, pl. cxiv. D. f. 1, 2, and (animal) pl. UU. f. 2.

BODY white, with a faint tinge of brownish-yellow: *head* large and broad, deeply cloven or bilobed in front: *tentacles* triangular, flanking the head, folded back or carried erect at the will of the animal: *eyes* very small, but distinct and black, widely separated; when the animal is crawling they are outside the shell, some way behind the head; when it is at rest this part of the animal is to some extent withdrawn, and the eyes are seen through the front of the transparent shell: *foot* oblong, rounded in front (where it is broader than in the middle), and unequally forked behind, like the tail of a shark: *gill-plume* pale yellow: *ovary* brown.

SHELL cylindric-oval, dilated in the middle, and nearly equally broad at each end; it is quite transparent and lustrous: *sculpture*, very slight and indistinct spiral lines (perceptible towards the spire only) and the usual marks of growth: *epidermis* inconspicuous: *colour* clear white, except the nucleus or embryonic whorl which is brownish-yellow: *spire* abruptly truncated: *whorls* 3–4, angulated at the top; the first is oval, twisted inwards, and slightly prominent: *suture* deep and channelled: *mouth* rather narrow on the upper part and very wide below; in full-grown specimens it never extends to the spire, and is shorter than in the last species; base expanding and obliquely rounded: *outer lip* flexuous, contracted and inflected at about one-third of its length from the top; outer corner bluntly angular; inner corner considerably receding and incurved: *inner lip* folded over the pillar, elsewhere wanting: *pillar* short, almost straight above, and curved below: *fold* obscure: *umbilicus* distinct and deep, although small. L. 0·2. B. 0·125.

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* Glassy.

Habitat: Living in the laminarian zone, on various parts of the British coast, and dead in deeper water. I will mention a few localities (out of about thirty which I have noted), to show the extent of distribution:—Guernsey, Cornwall, Dorset, South Devon, South Wales, Donegal, Galway, Cork, Dublin, west and east of Scotland, Shetland, and the north of England. Fossil at Dalmuir (Crosskey and Robertson); post-glacial bed in Norway, 50 feet (Sars); Sparebakken near Christiania (Robertson). Its existing range abroad comprises Kiel Bay (Meyer and Möbius), Sweden (Lovén and Malm), Norway (Danielssen and others), Iceland (Torell), Greenland (Möller and others), Massachusetts (Gould), New England (Stimpson), Madeira and Canaries (M'Andrew); depths 10–60 f.

The animal differs from that of *U. expansus* in having eyes, and in the extremity of the foot being unevenly lobed or heterocercal; the shell may be distinguished by its smaller size, want of angularity in the middle, and by its larger and more conspicuous umbilicus.

U. pellucidus of Brown is the adult, his *U. minutus* the half-grown shell, and his *U. candidus* the young; Gould described this species as *Bulla debilis*, and Möller as *B. subangulata*. It is not the *B. hyalina* of Gmelin.

Genus III. A'CERA*, (*Akera*) Müller. Pl. VIII. f. 3.

Body gelatinous, not containable within the shell: *mantle* forming at the rear a cylindrical or thread-shaped process, which occupies a slit in the front of the spire when the animal is at rest: *head* snout-like and extensile: *tentacles* none: *eyes* placed on each side of the head, near the front: *foot* very large and flexible, expanding into broad wing-like lobes (one on each side), which fold back over the shell and front of the body, a great part of which is covered by them: *gizzard* horny.

Shell tumid, very thin and elastic: *spire* exposed, and truncated: *whorls* angulated or keeled at the top; the first is nipple-shaped, and the last is partly separated from the preceding one: *suture* deeply excavated: *mouth* occupying nearly the whole length of the shell, open in front and contracted behind: *pillar* sharp-edged: no *operculum*.

Perhaps this and *Bulla* subsist on soft organisms; their gizzards seem adapted to such food, not being, like the calcareous millstones with which *Scaphander* and *Philine* are provided, strong enough to crush hard shells. The odontophore or tongue of *Acera* is broad, and has numerous spines in each row; that of *Utriculus* is narrow, and has only two spines in a row. The shell consists of two layers—the inner one membranous, and the outer testaceous.

It is not the "Acère" or *Bulla carnosa* of Cuvier (*Acera*, Lamarck), which belongs to the *Aplysia* family and is shelless. Leach called the present genus *Eucampe*.

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* Without horns (or tentacles).

ACERA BULLA'TA*, Müller.

Akera bullata, Müll. Prodr. Zool. Dan. p. 242, no. 2921; F. & H. iii. p. 527, pl. cxiv. D. f. 4–6, and (animal) pl. VV. f. 6.

BODY varying in colour from greyish or nearly clear white to pale yellowish-white or orange, covered with minute and numerous flake-white or dark specks, and usually streaked in front with interrupted lines of purplish-brown: *mantle* spread over the underside of the shell, and partly over the spire or crown: *head*, when the animal is crawling, attenuated, and sheathed underneath by the side lobes of the foot; it is wedge-shaped and bilobed in front (so that occasionally the corners assume the shape of ears or tentacles), and margined by a narrow purplish-brown line: *eyes* small and black, but always perceptible: *foot* oblong, swollen at its base; side lobes or flaps slightly tuberculated; front rounded and narrower than the posterior portion, where the foot dilates and is truncated at the extremity, with angular corners: [*odontophore*, rhachis minute, erect, broader at the base, which is produced on each side, having the top expanded and compressed on the upper part, the cutting-edge bent downwards and one-cusped, with a notched crest on each side; uncini about 21, forming long hooks which are longer in the middle row, the first furnished on the inner side with short wings and jagged, the rest always more slender (Lovén):] *gizzard* composed of a dozen triangular plates.

SHELL forming a short oval, dilated in the middle, and almost equally broad at each end, semitransparent and glossy: *sculpture*, extremely fine, close-set, and wavy microscopic spiral striæ, which pervade the whole surface: *epidermis* filmy but distinct, brownish-yellow of different shades: *colour*, under the epidermis, whitish with sometimes a faint tinge of green: *spire* truncated, sometimes slightly prominent: *whorls* 6, ridged or keeled at the top; the first is globosely oval and intorted: *suture* deep and channelled, with sloping sides; it is slit or narrowly open in front for a considerable distance, so as to disconnect the outer part of the body-whorl from the preceding whorl, and to make the shell elastic when held between the thumb and fingers: *mouth* somewhat contracted above, and very wide below, with a rounded base; it extends nearly the whole length of the shell: *outer lip* flexuous, folding inwards on the upper part; outer corner rounded; inner corner incurved at the further extremity: *inner lip* consisting of a rather thin glaze on the pillar and within the mouth: *pillar* slightly folded, and projecting; there is no umbilicus. L. 1·25. B. 0·8.

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* Inflated.

Var. *nana*. Undistinguishable except by its dwarf size.

HABITAT: Oozy ground and mud-flats (often among *Zostera*) in the laminarian zone, in many estuaries, and along our southern, Irish, Scotch, and Zetlandic coasts; Walton-on-the-Naze (W. B. King); Orwell River (Clarke); Scilly Isles (Lord Vernon); Guernsey (Hanley); Jersey (Dodd). It is gregarious. The variety occurs in Lough Larne and Balta Sound at low-water mark and in 3–5 f. (J. G. J. and M'Andrew); Norway (Lovén). Mr. Grainger found the typical form in the Belfast deposit. The foreign distribution of this species extends from Öxfjord in Finmark (Sars) to Vigo Bay (M'Andrew), the French and Italian coasts of the Mediterranean, the Adriatic, and Ægean; depths recorded 2–20 f.

A. bullata flits about, like a Pteropod, by means of its ample and flexible foot-lobes. The account given by Olivi of its swimming and migratory habits is very interesting, and helps to explain the sudden appearance and disappearance of certain marine mollusca in particular localities. "The fishermen call them *sea-snails*, and assured us they were very lively in warm weather, and sometimes quitted their shells; this circumstance, however, is to be doubted" (Montagu). Mr. Hyndman says that when touched they give out a purple liquid. The fact of *Acera* having eyes was, I believe, first noticed by me in the 'Annals and Magazine of Natural History' for September 1859. The head bears a fanciful resemblance to the snout of a restored *Dino-*

therium. According to Professor Lovén the egg-case of the present mollusk may be compared to a rope twisted in different ways. I have some remarkably large specimens of the shell, which the late Dr. Farran procured in Connemara; they are upwards of an inch and a half in length, and nearly an inch and a quarter in breadth. The flounder appears to feed on it, Müller having taken the shells from the stomach of one caught in the Cattegat.

This is probably the *Bulla canaliculata* of Linné; but his diagnosis being too concise, and no habitat given, there may be some doubt as to the identification. It is the *Voluta Jonensis* of Pennant, *B. voluta parva* &c. of Chemnitz, *B. akera* of Gmelin, *B. Norvegica* of Bruguière, *B. resiliens* of Donovan, *B. fragilis* of Lamarck, *Eucampe Donovani* of Leach, and *B. elastica* of Danilo and Sandri.

Genus IV. ACTÆ'ON*, (*Acteon*) De Montfort.

Pl. VIII. f. 4.

Body fleshy, containable within the shell: *head* contractile, squarish, depressed, and cloven in front: *tentacles* ear-shaped or lobular: *eyes* placed in the middle of the head, below the tentacles: *foot* oblong, cloven in front, but not expanding at the sides: [*odontophore*, rhachis none; uncini 11, shaped like long broken hooks, the largest of which form the middle row, inner side resembling a rounded wing, outer side having a notched crest at the bending (Lovén).]

Shell moderately solid, oval, spirally striated: *spire* prominent and bluntly pointed: *whorls* rounded, and connected throughout; the first is twisted inwards: *suture* well marked, but not excavated: *mouth* occupying about two-thirds of the shell in length: *pillar* furnished near the base with a ridge-like fold, which is continued within the spire: *operculum* fitting the irregular shape of the mouth, and altogether horny (not partly testaceous, as in *Odostomia*): spire small, with the nucleus on the inner side at the base of the shell, ear-shaped, and defined or separated from the greater part of the operculum by a furrow on the upper- and a ridge on the underside.

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* A mythological name.

This generic name and its synonym *Tornatella* were applied by Grateloup, Nyst, and Sismonda to species of *Odostomia*; and their shells have certainly a degree of similarity. But the apex of the spire in *Actæon* is regular, instead of being reversed; and the animal is different from that of *Odostomia*. (See page 110 of this volume.) Nearly twenty years ago Mr. Alder pointed out the affinity of *Actæon* to *Bulla*; and his views have been confirmed by the observations of other conchologists. Indeed Linné at first placed our typical species in *Bulla*, although he afterwards removed it to *Voluta*. The operculum was described by Turton, in his little treatise entitled "Conchology, arranged on the amended system," which was published in 1829. Delle Chiaje was the first to make known the animal. The present genus exhibits also a slight analogy to *Melampus*; but the spire of that shell is hollow, and has no internal partition.

Actæon has an extensive distribution, both in time and place; according to Woodward it comprises 16 recent and 70 fossil species.

It is the genus *Tornatella* of Lamarck and *Speo* of Risso. The name *Actæon* was used by Oken (subsequently to De Montfort's work) for a genus allied to *Aplysia*, which is now recognized as the *Elysia* of Risso.

ACTÆON TORNA'TILIS*, Linné.

Voluta tornatilis, Linn. S. N. p. 1187. *Tornatella fasciata*, F. & H. iii. p. 523, pl. cxiv. D. f. 3, and (animal) pl. VV. f. 7, as *T. tornatilis*.

BODY pale yellowish-white, with a slight purplish tint and minute specks of flake-white: *mantle* thick, sometimes folded over part of the underside of the shell, and forming an angular lobe or process just below the junction of the outer lip with the body-whorl of the shell: *head* large and broad, deeply bilobed in front, and extending (when the animal is in motion) beyond the foot: *tentacles* large, leaf-like or obtusely triangular, either carried erect or partly reflected on the front of the shell: *eyes* black, minute, and sometimes concealed beneath the outer integument, or "immersed in the skin:" *foot* large and widely expanded, bilobed in front, with small but sharp angular corners on each side of that part, bluntly pointed behind; the lobes of the head, the tentacles, and the front of the foot occasionally correspond in position, so as to present a triple row of curves: *verge* scimitar-shaped and thick, placed behind the right-hand tentacle: [*gills* consisting of a single long and coarsely pectinated plume (Clark).]

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* Turned in a lathe.

SHELL conical above, somewhat attenuated at the base, and barrel-shaped in the middle; it is opaque and rather glossy: *sculpture*, numerous fine spiral impressed lines, which are more or less distinctly punctate on the upper part; at the base (where the lines become broader and groove-like) they are crossed by finer and close-set longitudinal striæ; the spiral lines are not quite regular in their relative distance, and some are deeper than others; in one specimen I counted 70 on the body-whorl, 12 on the penultimate, 8 on the next, and 4 on the preceding whorl, the top whorls being eroded: *epidermis* inconspicuous: *colour* light pink or fleshcolour, with three white bands on the body-whorl, and one beneath the suture on each of the other whorls; those on the body-whorl are thus disposed—a narrow one beneath the suture, a second and broader band on a level with the top of the outer lip (which band is usually continued round the base of the upper whorls), and the third (which is equally broad, but occasionally wanting) encircling the middle of the body-whorl; the latter two bands are often defined by lines of a deeper pink: *spire* short and conical: *whorls* 7–8, compressed although convex; the last (as usual in this family) is disproportionately large, but the rest gradually decrease in size towards the apex; the first is tumid and obliquely intorted: *suture* fine and apparently slight, but seen to be narrowly channelled by looking down upon the spire: *mouth* narrowly and irregularly pear-shaped, acute-angled above and obtuse-angled below, with the base rounded and effuse or expanding outwards: length two-thirds of the shell: *outer lip* gently curved, not folding inwards: *inner lip* forming a thin glaze on that part of the body-whorl which lies within the mouth, and broadly reflected over the lower part: *pillar* very short and flexuous: *fold* or plait tooth-like and strong, winding obliquely along the pillar: *operculum* horny, long and wing-like; the inner part has the aspect of a *Cristellaria*, with a nearly terminal spire; the whole surface of the operculum is marked by puckered lines of growth, and the outer part is slightly and irregularly scored by curved and other scratch-like striæ. L. 0·75. B. 0·4.

Var. 1. *subulata.* Smaller and narrower, with an elongated spire. *A. subulatus*, S. Wood, Crag. Moll. pt. 1. p. 170, t. xix. f. 7 *a*, *b*.

Var. 2. *tenella.* Body milk-white: *foot* lanceolate and slender. Shell smaller, thinner, semitransparent, more glossy, and of a paler hue, sometimes without bands; the young have the middle of each whorl smooth. *A. tenellus*, Lovén, Ind. Moll. Scand. p. 11.

Var. 3. *bullæformis.* Smaller and regularly oval, with a much shorter spire.

Habitat: Sandy bays, at low-water mark of spring tides, to about 20 f.; not uncommon, and widely distributed. Capt. Beechey dredged a dead specimen in 145 f. off the Mull of Galloway. Var. 1. Fishguard and the Hebrides; rare. Var. 2. Muddy sand in 80–90 f., Shetland. Var. 3. Loch Fyne, in mud, 40–50 f. (A. M'Nab). This species occurs in a fossil state at Belfast (Grainger); boulder-clay in Caithness (Peach); Red and Coralline Crag at Sutton (Wood); post-glacial beds in Norway, 50–100 feet, some specimens retaining their coloured bands (Sars); lower Crag of Antwerp (Nyst); Italian tertiaries (Scacchi and others); Germany, Greece, and Vienna Basin (Hörnes). The 1st variety is described by Wood from the Red Crag at Sutton. *A. tornatilis* ranges from the Loffoden Isles (Sars), and Iceland (Steenstrup), to the Ægean (Forbes); depths recorded 10–100 f. The variety *tenella* inhabits sandy mud in deep water on the Scandinavian coast (Lovén and M'Andrew).

It makes a shallow hole or burrow in the sand, and is rather sluggish. Forbes and Hanley say that, when handled, it gives out a milky fluid tinged with purple. My largest specimen is not quite an inch in length. Very juvenile conchologists call these shells "barrels."

This is the *Turbo ovalis* of Da Costa, *Auricula bifasciata* of Martini, and *Speo bifasciatus* of Risso (his *S. tornatilis* being fossil and apparently a different species); the young is *Tornatella pusilla* of Forbes, *T. pellucida* of Macgillivray, and possibly *T. puncto-striata* of Professor C. B. Adams from Massachusetts; the fry is *T. globularis* of Forbes.

Voluta heteroclita of Montagu, said to be from Dunbar, is one of Laskey's more than suspicious discoveries; it is described as having a reversed spire and being a quarter of an inch long. Forbes and Hanley refer this, with doubt, to the present genus. It may be a young exotic land shell, of the *Achatina* family.

Genus V. BULLA*, Klein. Pl. VIII. f. 5.

Body gelatinous or fleshy, not containable within the shell: *mantle* thickened at its edges, and folded behind: *head* snout-shaped: *tentacles* more or less distinct, but forming a continuation of the head: *eyes* not perceptible in every species; when present they are placed at the base of the tentacular disk: *foot* very large, expanded on each side in the shape of broad lobes or flaps, which serve as fins for swimming, and cover part of the shell and of the upperside of the body: *gizzard* composed of 3 horny equal-sized oval plates.

Shell oval: *spire* involute, usually concealed: *mouth* extending the whole length of the shell: *pillar* sometimes furnished with a fold or plait: *operculum* none.

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* A bubble.

Bulla was also used by Rumph, previously to Klein, but not in a generic sense. De Montfort cites 32 vernacular names by which the shell was known in different countries; he called the genus *Bullus*. Leach proposed *Haminæa* or *Haminea* and *Roxania* for our two indigenous species; the first of these names was given in Turton's tract on conchology.

A. Thin; crown imperforate, and spire wholly concealed.

1. Bulla hy'datis*, Linné.

B. hydatis, Linn. S. N. p. 1183; F. & H. iii. p. 530, pl. cxiv. d. f. 7, and (animal) pl. UU. f. 3.

Body gelatinous, when fully extended and in motion of an elongated oval shape and nearly as long again as the shell; colour variable, usually a mixture of purplish-brown, cinereous, and orange-yellow, disposed in minute granular or confluent specks: *head* large, notched in front: *tentacles* united, so as to form a small squarish lobe or disk, somewhat narrower and indented behind: *eyes* very distinct, placed far back on the tentacular disk, and not very close together [" closely set," F. & H.]; they are black, and each lies in the centre of a minute circular lucid spot: *foot* sinuous, capable of being considerably dilated and extended; the side-lobes are often reflected over the greater part of the shell: *gizzard* encircled by a cartilaginous or muscular ring, with the alimentary canal issuing from its centre; plates dark purplish-brown or chocolate, somewhat resembling the shells of a *Chiton*. (Montagu and Clark).

Shell roundish-oval, fragile, semitransparent and glossy: *sculpture*, extremely numerous, delicate, spiral striæ, besides lines of growth; the striæ are scarcely perceptible unless with microscopic aid: *epidermis* yellowish-brown, thicker than is usually the case in this family: *colour* greenish-yellow, with the crown and pillar white: *spire* concealed; the crown or apex is obliquely indented or slightly umbilicate: *mouth* irregularly elliptical, rather narrow (although not much contracted) above, and pear-shaped below; total length exceeding that of the spire: *outer lip* more or less curved, not folding inwards; it projects beyond the crown: *inner lip* forming a broad and flexuous glaze: *pillar* short, solid, smooth, and curved. L. 1. B. 0·75.

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* A water-coloured gem.

Var. *globosa.* Smaller, thinner, globular, pale yellowish-green or creamcolour.

Habitat: Mud-flats and ooze in the littoral and laminarian zones, on the coasts of Hants, Dorset, Devon, and Cornwall; Sark, in 15–20 f. (J. G. J.); Jersey (Dodd and Jordan); Manorbeer, near Tenby (J. G. J.); Birterbuy Bay, co. Galway (Farran); Bantry Bay (Mrs. Puxley and Leach); Cork Harbour (Humphreys); Balbriggan in Dublin Bay (Turton); ? Scarborough (Bean); ? Dunbar (Laskey). A local species. The variety was taken by Mr. Clark at Exmouth. It is impossible to define exactly the geological and geographical range of *B. hydatis*; because two European species have been confounded by authors under that name. It is said by Cantraine and others to occur in the Italian tertiaries; and there is no doubt that it inhabits the Atlantic shores of France and Portugal, both sides of the Mediterranean, the Adriatic, and Ægean, at depths of 0–69 f.; Canary Isles (M'Andrew).

More than thirty years have elapsed since I had the good fortune to observe, in company with my late friend Mr. William Clark, hundreds of these creatures, in the shallow and slushy pools left by the tide near high-water mark on Dawlish Warren; soon afterwards, owing to a shifting of the sands, these pools disappeared, and with them the *Bulla.* When it swam or floated, the side-lobes of the foot were withdrawn from the shell and spread out like a pair of fins. The shell is occasionally distorted, having either a rude spiral groove below the apex or a depression behind the pillar.

It is the *B. ampulla* of Pennant (not of Linné), *B. navicula* of Da Costa, *B. cornea* of Lamarck (who erroneously referred to it the *B. Cranchii* of Leach), *B. papyracea* of Ulysses' Travels (*fide* Dillwyn), and *Haminœa Cuvieri* of Leach; the young appears to be the *B. utriculus* of Risso (not of Brocchi), and, according to Scacchi, the *B. pisum* of Delle Chiaje.

B. elegans (*H. elegans*) of Leach is much smaller, oblong, narrower, and more solid, with the outer lip not projecting beyond the crown. Dr. Leach records it from Tenby, Swansea, and the Devon coast; but I believe he was misinformed as to at least the first two of these places. I have it in the Turtonian collection. Mr. Lukis and Mr. Macculloch found it at Herm, and I dredged a fragment in Guernsey; so that this species may be looked for on our southern coasts. It is common in the Mediterranean, and is probably the *H. folliculus* of Menke.

Another species, equally doubtful as a native of our seas, is *B. dilatata* of Leach. This differs from *B. hydatis* in its much smaller size, depressed shape, microscopical and more close-set spiral sculpture, and in its widely expanded mouth, the upper corner of which projects far beyond the crown, in a wing-like fashion. Falmouth (Leach); Dublin Bay (coll. Turton); Cork Harbour (Humphreys); Loire-Inférieure (Cailliaud); Ile de Rhé, in the Gulf of Gascony (J. G. J.); Grand Canary (M'Andrew). *B. pemphis* of Philippi (from the Red Sea) and *B. virescens* of Sowerby (from Pitcairn's Island) are allied to the present species.

B. Solid; crown perforated and exposing part of the spire.

2. B. UTRI′CULUS*, Brocchi.

B. utriculus, Brocchi, Conch. foss. Subap. i. p. 633, t. 1. f. 6 *a*, *b*. *B. Cranchii*, F. & H. iii. p. 533, pl. cxiv. D. f. 8, 9, and (animal) pl. VV. f. 2.

Body greyish-white, faintly tinged above with brownish-yellow: *mantle* thick, protruded behind, and folding over the crown of the shell as well as partly over its underside: *head* very large and flexible, wedge-shaped in front: *tentacles* triangular or ear-shaped, turned back over the front of the shell, and covering nearly one-third of it: *eyes*, none perceptible: *foot* squarish, truncated in front, rounded behind, and forming on each side a broad triangular flap, which is folded over part of the head and tentacles: *ovary* yellow, visible through the shell.

Shell oval, with a tendency to become cylindrical, rather solid, semitransparent and glossy: *sculpture*, numerous spiral striæ or impressed lines, which are visible to the naked eye; towards each end they are stronger, and alternately large and small (sometimes two or three smaller striæ between two of the larger size), and they are throughout closely punctate in consequence of the interstices being crossed by fine longitudinal striæ; the spiral striæ are much slighter in the middle of the shell, which in the young is usually quite smooth: *epidermis* reddish-brown; it is chiefly persistent on the spiral striæ, which are therefore darkly lineated: *colour* pale yellowish or creamcolour, occasionally milk-white: *spire* partly exposed; crown perforated, and obliquely encircled by a thick angular rim: *mouth* as in the last species, but narrower; its length exceeds that of the spire: *outer lip* not much curved in the middle, nor folding inwards; it projects a little beyond the crown: *inner lip* slight: *pillar* short, thick, and flexuous; at its base is a rather strong fold, which makes the lower part of the mouth appear channelled; behind the pillar is a small and groove-like umbilicus. L. 0·5. B. 0·3.

Var. *oblonga*. Smaller, longer in proportion to its breadth, and more cylindrical.

Habitat: Muddy sand in 20–86 f., Plymouth (Prideaux, *fide* Leach); Torbay and Plymouth (coll. Turton); Falmouth (Cranch, *fide* Leach, Cocks, and Hockin); Dogger bank (Parke); Scarborough (Bean); Northumberland (Alder); Berwick Bay (Johnston and Mennell); Arran Isles, co. Galway (Barlee); Cork Harbour (Humphreys); co. Antrim (Hyndman); western coasts of Scotland (Barlee and others); Moray Firth (Gordon); Aberdeen (Macgillivray); Shetland (M'Andrew and others). I dredged a single specimen of the variety in Loch Fyne. *B. utriculus* occurs in the Antwerp Crag and Bordeaux tertiaries (Nyst); upper miocene bed near Antibes (Macé); Italian tertiaries (Brocchi and others); Vienna basin (Hörnes). Its present distribution extends from Finmark (Sars) to the Canary Isles (M'Andrew), both sides of the Mediterranean (Cantraine, Weinkauff, and others), Adriatic (Brocchi and Brusina), and Ægean (Forbes); depths 20–140 f.

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* A husk of grain.

Its habits are sluggish. The head supports the front of the shell, while the foot forms the base of the living cushion. In the north it seems to be a favourite food of the haddock.

This species was at first considered by Brocchi the *B. striata* of Bruguière. Leach called it *B. Cranchii*, Johnston *B. punctura*, and Nyst *B. utricula*. *B. modesta* of Risso is probably the young. It may also be the *B. puncto-striata* of Mighels and Adams, from the eastern coasts of North America.

B. striata was described by Turton as British, under the name of *B. alba*. I cannot, on such authority, recognize it as indigenous. His specimens (two in number) have evidently been acted upon by muriatic acid, so as nearly to remove the outer and coloured layer. Dr. Gordon kindly sent me for inspection two specimens collected in North Uist and at Durness. How they got so far north is not easily explicable. I entertain a high opinion of Dr. Gordon's accuracy; but I must reserve my faith in the present case until I see a *living* specimen from Scotch waters. *B. striata* inhabits the Mediterranean, Adriatic, and Black Sea; and Drouet has recorded it from the Azores. The only other Atlantic habitat, of which I am aware, is Faro in Algarve, where M'Andrew procured it.

B. media of Philippi (a common West-Indian shell) was erroneously described by Montagu as *B. ampulla* of Linné, the locality which he gave being Falmouth Harbour. Possibly *B. utriculus* was meant. Laskey must have been determined to find it also at Dunbar; for it figures in his list of the shells of North Britain!

Genus VI. SCAPHANDER*, De Montfort.

Pl. VIII. f. 6.

Body fleshy, not containable within the shell: *mantle* thick, folded behind: *head* oblong, broad, and depressed: *tentacles* united, and forming part of the head: *eyes* wanting: *foot* dilated, with narrow and reflected side-lobes: *gizzard* large, composed of 3 calcareous plates; the larger two (which form the sides) are ear-shaped or triangular, and the smallest (which lies between the others) is irregularly oval, and doubled.

Shell pear-shaped or oval, spirally striated: *spire* involute, entirely concealed in the adult; crown obliquely truncated. perforated in the young: *mouth* extending the whole length of the shell, contracted behind, and expanding in front: *pillar* smooth, and blunt-edged: *operculum* none.

The curious gizzard was described and figured by the Cavalier Gioeni in 1783 as the type of a new family of multivalve shells, to which he proposed to give his own name! Modern naturalists have been more modest, and have contented themselves with striving for a sort of vicarious immortality, by associating the names of their wives with their real or supposed discoveries. *Gioenia,* as a genus, was adopted by Bruguière; Retz substituted for it *Tricla.* This strange mistake was exposed and rectified by Draparnaud.

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* A boatman; badly compounded.

An obsolete synonym of the present genus is *Assula* of Schumacher.

SCAPHANDER LIGNA'RIUS*, Linné.

Bulla lignaria, Linn. S. N. p. 1184. *S. lignarius*, F. & H. iii. p. 536, pl. cxiv. F. f. 3, and (animal) pl. VV. f. 5, as *S. lignaria.*

BODY fleshcolour, orange, brownish-yellow, or creamcolour: *mantle* folded over the underside of the shell and the lower part of the crown or apex: *head* shield-like, wedge-shaped and rounded or slightly indented in front: *tentacles* forming a single squarish lobe, being a continuation of the head; this lobe has angular or ear-shaped corners on the upper or hinder part: *eyes*, none perceptible: *foot* bulky, of an oval shape, squarish, corresponding and coextensive with the head in front, expanded and bluntly notched behind; the side-lobes frequently overlap part of the shell: [*odontophore,* rhachis wanting; uncini arranged in a single row, claw-shaped, crenellated on the hinder margin towards the point; outer side winged, with a crest at the base (Lovén).]

SHELL pear-shaped, peaked or acuminated at the top, and expanded at the base, rather solid, nearly opaque, and somewhat glossy: *sculpture,* numerous spiral striæ or fine grooves, which (owing to the size of the shell) are very conspicuous; they are equally strong in every part, and are equidistant, except at the top (where they become more or less crowded), and also except an occasional slighter intermediate stria; the interstices of the spiral striæ or grooves are crossed by fine and close-set longitudinal striæ, which often give the former a punctate appearance; the whole surface is covered with close-set microscopic spiral lines and with equally numerous and minute longitudinal striæ, producing by their intersection a slight cancellation: *epidermis* orange or tawny, passing into chestnut: *colour,* under the epidermis, yellowish-white or creamcolour; young and half-grown specimens are often adorned with narrow reddish-brown zones, parallel and alternating with the white spiral striæ and their walls: *spire* loosely coiled, not exposed in the adult, being coated over by successive deposits from the hinder lobe of the mantle: *crown* obliquely indented, and encircled by an angular rim; it is perforated in the young and fry, so as to show the outer part of the spire: *mouth* narrow above, and dilated below, with a rounded base; its length exceeds that of the spire: *outer lip* not much curved in the middle; it projects beyond the crown, forming in that part an obtuse angle: *inner lip* broad and flexuous, consisting of a rather thick glaze: *pillar* arched, visible throughout by holding the shell upside down. L. 2·33. B. 1·5.

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* From its colour resembling that of fir-wood.

Var. 1. *alba.* White, with a creamcolour epidermis.

Var. 2. *curta.* Smaller and shorter, but not having the compactly convoluted spire and comparatively small mouth of *S. librarius.*

Habitat: All our coasts: it usually frequents the coralline zone, ranging as deep as 90 f.; but. Dr. Landsborough says that "at Whiting Bay, in Arran, it may be taken by digging in the sand at ebb tide." The 1st variety is generally diffused, but rare. Var 2. Shetland. This species occurs in the quaternary and upper tertiary beds at Belfast (Grainger); Greenock (Robertson); and the Red and Coralline Crag (Wood); as well as throughout Belgium, France, Italy, Germany, and the southern parts of Europe. Its distribution, in a living state, extends from Finmark (Danielssen and Sars) to Gibraltar (M'Andrew), and through the Mediterranean, Adriatic, and Ægean; depths 8–60 f.

This voracious mollusk does not despise any kind of animal food, from minute Foraminifera to the sea-mouse or *Aphrodita*, the spines of which I found in the gizzard of one individual. *Corbula gibba* is evidently a favourite morsel; and I have observed *Dentalium entalis*, *Odostomia rufa*, and *Ditrupa arietina* in other specimens.

George Humphreys mentions *Cylichna cylindracea* also. The *Dentalium* and *Ditrupa*, when sticking in the gizzard, look like spits through joints of meat. According to Landsborough ('Zoologist,' 1843, pp. 87, 88) "though they seem to indulge very freely as to quantity, they appear to be wiser than our biped gourmands; for they keep to one dish. In every one of the specimens I procured, the capacious gullet was filled with the fry of *Mactra subtruncata*. The gullet was in the form of a cornsack, quite distended, for each contained some scores of these little bivalve shells in an unbroken state. The sack, however, gradually emptied itself into the gizzard; and in this shelly mill the shells and their contents were reduced to powder, or rather a fine paste, well fitted, no doubt, to be wholesome nutriment for the industrious little marine miller." The plates of the gizzard are white, with the middle portion of the inside brownish-yellow and raised, the centre being white and ground down by use. The side-plates slope from a boss in the centre to a sharp edge; and the intermediate or small plate resembles an opera hat: in the young it is not unlike *Ancylus lacustris*. Among other wonderful tales of the sea, the Guernsey fishermen will tell you that the *Scaphander* bites off a portion of the outer lip of its shell, when it finds itself a prisoner in the trawl-net! It is preyed on by the haddock. A monstrosity in my collection has the crown deeply and widely channelled.

Risso described it as *S. lignarius* and *S. giganteus*; the fossil shell of the same species is probably his *S. targionius*. *Bulla zonata* of Turton and *S. Brownii* of Leach are the young; I once thought (but wrongly) that the former might be *S. librarius* of Lovén.

Of the last-named species I obtained a very young specimen in my Shetland dredgings. *S. librarius* is much smaller than *S. lignarius,* of an oval shape, having the spire compactly coiled, and the mouth consequently more contracted. It inhabits the Scandinavian coasts, in from 20 to 150 f., and (*fide* Torell) Iceland.

Genus VII. PHILI'NE*, Ascanius. Pl. VIII. f. 7.

Body semioval, gelatinous and slimy, not containable within the shell: *mantle* shield-like, covering the shell and gill-plume: *head* oblong, wedge-shaped in front: *tentacles* not distinct, but forming part of the head: *eyes* wanting: *foot* broad, folded on each side as a flap, which together with the pallial disk and head give the animal a quadrilobate appearance: *gizzard* composed of three calcareous plates, which in some species are shuttle-shaped and equal in size, and in other species are similar to those of *Scaphander*: *odontophore* without any rhachis or central tooth; the uncini are claw-shaped, and arranged in single or double file.

Shell wholly internal (being concealed under the mantle), and thin: *spire* loosely coiled, small, and truncated: *mouth* very large and open, not always as long as the spire: *pillar* sharp-edged, flexuous, and visible throughout.

A description and figure of this genus by Professor Ascanius were published in the 33rd volume of the Transactions of the Royal Academy of Sciences at Stockholm for 1772, the species on which it was founded being the *Bulla aperta* of Linné. The 'Zoological Journal' for 1827 contains a valuable and interesting account by Mr. Clark of several British species which he examined in a living state.

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* Possibly from "le Philin" of Adanson, a fancy name, applied by him to a species of *Cymbium*. It should be *Phylline*, if derived from the leaf-like appearance of the shell; but that name was given by Oken to a genus of parasitic Annelids.

It is the genus *Lobaria* of Müller, and *Bullæa* of Lamark; the former was carelessly referred by Rang to the shelless genus *Acera* ("acère") of Cuvier.

A. Having a chain-like or punctate sculpture; spire conspicuous.

1. PHILINE SCABRA*, Müller.

Bulla scabra, Müll. Zool. Dan. ii. p. 41, t. lxxi. f. 10–12. *P. scabra*, F. & H. iii. p. 543, pl. cxiv. E. f. 4, 5, and (animal) pl. VV. f. 1, as *Bullæa scabra*.

BODY elongated, whitish or creamcolour, sometimes minutely speckled with black: *mantle* folded over the crown and underside of the shell, ending behind in two angular points: *head* large, broad, and gibbous; the upper part or tentacular disk is rounded behind, and marked lengthwise by a slight darkish line of division: *foot* oval and very large, wedge-shaped in front, and rounded behind; side-lobes broad: *gizzard-plates* shuttle-shaped and equal-sized, having a flat rib down the middle with a small depression on each side: [*odontophore* armed with two rows of uncini; inner ones much the larger, lobed on the inside and jagged; outer ones minute and plain-edged (Lovén).]

SHELL resembling in shape a miniature *Scaphander lignarius*, but more cylindrical; it is of a delicate texture, semitransparent, and of a glistening and iridescent lustre: *sculpture*, numerous and close-set spiral and parallel rows of minute oval dots which are interwoven and arranged like the links of a chain; some of these rows being intermediate, and apparently squeezed or compressed at the sides, become merely fine lines; the front edge or base of the mouth and top of the outer lip are exquisitly fringed with sharpish points, like short teeth of a comb: *colour* clear white when the shell is extracted from the animal, afterwards becoming milk-white: *spire* slightly prominent: *whorls* 3; the body-whorl (as usual in this genus) is disproportionately large and voluminous; the other two are small, with an indistinct and thickened nucleus: *suture* deep and channelled: *mouth* acute-angled above, and greatly expanded below, with a squarish base: *outer lip* gently curved, folding inwards on the upper part;

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* Scratched.

the top of this lip is below the spire; inner corner cloven or excavated, so as to cause a disjunction of the suture in front and a partial separation of the body-whorl from the next: *inner lip* forming a rather thick and broad glaze. L. 0·2. B. 0·1.

HABITAT: Living in sand at low-water mark of spring tides, Gwyllyn vase, Falmouth (Barlee and Miss Vigurs, *fide* Cocks); Hayle and Falmouth (Hockin); Porthcurnow Cove, near the Land's End (Miss Lavars); Mounts Bay, Penzance (Templer); Scarborough (Bean and J. G. J.); Northumberland coast (Alder); Dogger bank, Coquet, and Berwick Bay (Mennell); Berwick (Johnston); Tenby (Lyons); Cork, in stomach of the black sole (Humphreys); co. Galway (Barlee); co. Antrim (Hyndman and Waller); west of Scotland and the Hebrides (Barlee and others); Moray Firth (Gordon); Aberdeenshire (Macgillivray and Dawson); Shetland (Forbes and others): muddy sand and mud, 3–85 f. Coralline Crag, Sutton (Wood); glacial bed in Norway, 50–70 feet (Sars); Nice (Risso); Palermo (Philippi). Inhabiting Greenland (Möller); Iceland (Steenstrup); Scandinavia, from the Loffoden Isles (Sars) to Kullaberg in Skåne (Lilljeborg); Vigo Bay (M'Andrew); Gulf of Lyons (Martin); Spezzia (Doria); Sicily (coll. Petit): depths recorded 15–140 f.

From the stomachs of a flounder (Müller) and haddock (Gordon). A comparatively gigantic specimen was kindly presented to me by my old and esteemed friend Mr. Waller, who dredged it at Groomsport; it measures four lines by two and a quarter.

Very distinct from *Bulla scabra* of Chemnitz, which does not even belong to the present genus. Dillwyn called our shell *B. pectinata*; Risso described it (apparently) as *Scaphander patulus*; Leach (according to

Turton) gave it the name of *S. catenatus*; it is the *Bullæa granulosa* of Sars, partly the *Bullæa angustata* of Philippi, *Bullæa catena* and *Bullæa catenulifera* of Macgillivray, and *Bulla dilatata* of S. Wood.

P. lima (*Utriculus Lima*) of Brown is stated by him to have been found by Mr. Stewart Kerr at Greenock; and it would therefore be a glacial fossil of the Clyde beds. It is allied to *P. scabra*, but differs from that species in having a smaller and compact crown, a more produced spire, and a less patulous mouth. It is the *Bulla lineolata* of Couthouy, and probably the *Bullæa punctata* of Möller (not of Clark), its existing distribution being confined to the eastern coasts of North America and to Greenland.

2. P. CATE'NA*, Montagu.

Bulla catena, Mont. Test. Br. (i.) p. 215, t. 7. f. 7. *P. catena*, F. & H. iii. p. 545, pl. cxiv. E. f. 6, 7, and (animal) pl. UU. f. 4, as *Bullæa catena*.

BODY on the upper part yellowish-white; the shield or anterior portion, and the lateral lobes caused by the reflexion of the foot on the back, are sprinkled with close-set very minute reddish-brown points; the posterior part of the body is divided into one or two digitations. (Clark.)

SHELL oval, compressed and expanding outwards, of delicate but not fragile texture, semitransparent and glossy: *sculpture*, numerous and close-set spiral rows of minute links, arranged in a chain-like fashion, which vary in shape from roundish-oval to oblong, besides occasional intermediate lines as in *P. scabra*; the edge of the mouth (especially at its base and on the upper part of the outer lip) is finely scalloped by the continuation of the spiral sculpture: *colour* as in the last species: *spire* extremely small, but prominent: *whorls* 2–3, similar (except in size) to those in the last species: *suture* narrow, deep, and channelled: *mouth* equalling about three-fourths of the circumference of the shell, broadly oval, contracted above by the periphery, with a bluntly rounded (or almost truncated) base: *outer lip* flexuous, slightly indented or concave in the middle; the top is level with the spire, the shell being placed mouth downwards; inner corner cloven, and producing the same partial disconnexion of the body-whorl as in the last species: *inner lip* forming a broad and thickened glaze. L. 0·15. B. 0·1.

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* From its chain-like sculpture.

Var. *zona*. Rather more depressed, with a belt of clear white in the middle, taking in from eight to ten of the chain-like rows.

HABITAT: Exmouth, alive in rock-pools at the time of the lowest spring tides (Clark); on different parts of the coasts of South Devon, Cornwall, and Dorset (Montagu, Tyacke, *fide* Forbes's MS., J. G. J., and others); Guernsey (Barlee and J. G. J.); Tenby (J. Adams and J. G. J.); Manorbeer near Tenby, and Langland Bay near Swansea (J. G. J.); Scarborough (Bean and J. G. J.); Northumberland (Alder); Berwick Bay (Johnston); Cork (Humphreys, from the stomach of a sole, and J. G. J.); Miltown-Malbay, co. Clare (Harvey, *fide* Thompson); Arran Isles, co. Galway (Barlee); Bundoran, co. Donegal (J. G. J.); Dublin Bay (Walpole and J. G. J.); Lamlash, Isle of Bute (Landsborough); Skye (Barlee); Firths of Forth and Clyde (Brown); Shetland (Barlee). The variety is from Bigberry Bay, near Plymouth (Montagu), and Guernsey (coll. Turton and J. G. J.). *P. catena* occurs in the Coralline Crag at Sutton (Wood, as *Bullæa sculpta*); Palermo (Calcara, as *B. punctata*). Its extra-British distribution, as a recent species, appears to be southern, and comprises the Loire-Inférieure (Cailliaud), Mediterranean, from the Gulf of Lyons (Martin) to Sicily (Maravigna and Philippi), and Ægean, in 119 f. (Forbes).

The gizzard resembles that of *P. scabra*, but is smaller and has a shorter midrib. My largest specimens are from Galway and Shetland, and measure nearly two lines in length.

Montagu refers the *Bulla punctata* of Adams (Linn. Trans.) to this species: I believe he was right in doing so. It is probably the *Bullæa angustata* of Bivona (according to Philippi), and the *Scaphander catenatus* of Leach's 'Synopsis.'

3. P. ANGULA'TA*, Jeffreys.

SHELL rhomboidal, depressed, fragile, transparent and glossy: *sculpture*, numerous rows of very fine spiral striæ, composed of oval and almost microscopic dots, and appearing punctate; the upper part of the body-whorl is angulated or margined by a sharpish keel, between which and the suture is a flattened space marked with 5 of the spiral striæ and sloping towards the spire; there is also a tendency to angularity in other parts; edge of the mouth plain or smooth: *colour* clear white, becoming opaque in dead specimens which have been picked out of shell-sand; occasionally one or two transparent zones may be seen, as in the variety of *P. catena*: *spire* extremely small, slightly prominent: *whorls* 2–3, conspicuous; the outer edge of each is keeled or ridged: *suture* deep and channelled: *mouth* squarish, remarkably wide and large, nearly truncated at the base: *outer lip* forming an obtuse angle at the junction of the front and base; the top is higher than the spire, and it projects outwards (but all my specimens are more or less broken in this part); inner corner deeply and widely cloven, so as to make the disjunction of the outer whorl from the next very conspicuous: *inner lip* forming a narrow but thick ledge or fold, behind which is a slight depression. L. 0·1. B. 0·075.

HABITAT: Larne, co. Antrim, Hebrides, and Shetland, in 60–80 f. (J. G. J.); Aberdeenshire (Dawson). It is apparently rare.

The keeled spire will serve to distinguish this from any other species of *Philine* in the present section.

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[*] Angular.

4. P. QUADRA'TA*, Searles Wood.

Bullæa quadrata, S. Wood in Ann. N. H. iii. p. 461, pl. vii. f. 1. *P. quadrata*, F. & H. iii. p. 541, pl. cxiv. E. f. 2, 3.

BODY whitish and semitransparent: *head* rounded: *tentacles* not separate: *eyes* wanting: *foot* oblong, symmetrical and even with the head in front: *gizzard* minute; plates elliptical.

SHELL squarish-oval, convex, contracted or compressed on the upper part below the spire, and bluntly angulated in the middle; it is not very thin, is semitransparent, and when fresh of a glistening lustre: *sculpture*, numerous rows of fine spiral striæ, which are composed of minute oval dots and appear punctate; these striæ are irregularly disposed, being in some parts more close together than in others, and they here and there form intermediate and slight lines; the upper part of the body-whorl is thickened and rounded, and the middle is furnished with a blunt and slight spiral rib, which is usually visible also within the mouth; the top of the outer lip is delicately scalloped: *colour* white, crystalline when extracted from the animal: *spire* small, more or less sunken; apex obscure: *whorls* 2–3, rounded; the inner ones are minute: *suture* deep: *mouth* broadly oval, contracted above by the periphery, and expanded below, with the base obliquely curved and somewhat truncated: it occupies about two-thirds of the underside of the shell: *outer lip* nearly straight in front and forming an obtuse angle at the junction of that part with the base; the top is rather higher than the spire, and projects outwards; outer corner bluntly angular or rounded; inner corner receding and acute-angled, but not exhibiting any further disjunction of the outer whorl from the next: *inner lip* broad and thick. L. 0·25. B. 0·2.

HABITAT: Mud and sand, Dogger bank (Mennell and J. G. J.); Whitburn (Abbes and Howse, *fide* Alder); Arran Isles, co. Galway (Barlee); Moray Firth (Gordon); Aberdeenshire (Dawson); Orkneys, 12–40 f. (Thomas, *fide* Forbes); Shetland, 3–76 f. (M'Andrew and others); Coralline Crag, Sutton (Wood); post-glacial beds in Norway, 60–100 feet (Sars). Its existing distribution beyond our seas, as at present known, includes Nordland and Finmark, from 20 to 150 f. (Lovén and others), Greenland (Sars), and Massachusetts Bay (Stimpson).

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* Square.

The young and fry are more globose than the adult; in the former the spire is proportionally smaller and more depressed or umbilicate, and in the latter it is rudimentary and consists of only half a whorl. The fry is perfectly smooth and very glossy. In all these respects the present species differs from *P. angulata*.

It is the *P. scutulum* of Lovén, and *P. formosa* of Stimpson, the types of which I have examined.

5. P. PUNCTA'TA*, Clark.

Bullæa punctata, Clark in Zool. Journ. iii. p. 339. *P. punctata*, F. & H. iii. p. 547, pl. cxiv. E. f. 8, 9, and (animal) pl. UU. f. 5, as *B. punctata*.

BODY oblong-oval, above dirty white, marked with the finest longitudinal dark close lines, mixed with minute streaks and points, giving the whole surface a dark cloud-coloured sombre aspect [" tinged and speckled with reddish-brown on a yellowish ground," F. & H., ex fig. Alder]; hinder part digitated or lobed, and yellowish-white [" Its capital disk seems different in shape, and much shorter and broader than that of *catena*, and the margin of the mantle is not laminated," F. & H.]; *gizzard* minute, cylindrical, and yellow. (Clark.)

SHELL oval, convex, but somewhat compressed in the middle, of delicate texture, nearly transparent, and glossy: *sculpture*, extremely numerous and close-set spiral rows of minute rings or impressed circular dots, which are not united or chain-like, but appear punctate; edge of the mouth plain at its base and slightly scalloped at the top of the outer lip: *colour* as in all the foregoing species: *spire* very small, but prominent: *whorls* 2, similar to those of the other species: *suture* narrow, deep, and channelled: *mouth* regularly oval, rounded at the base: *outer lip* flexuous, widely indented or slightly concave in the middle; the top lies somewhat below the spire; outer corner bluntly angulated, and projecting; inner corner cloven and causing a disconnexion of the outer whorl from the next: *inner lip* narrow, folding over the pillar, behind which is a depression or approach to an umbilicus. L. 0·1. B. 0·075.

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* Punctured; not a classical word.

HABITAT: With *P. catena* at Exmouth (Clark); Torbay (Clark and J. G. J.); Burrow Island, near Saltash (Barlee and Hanley); Land's End and Hayle (Hockin); Whitesand Bay and Guernsey (J. G. J.); Scarborough (Bean and J. G. J.); Northumberland coast, with *P. catena*, "rarely found alive in pools among the rocks within tide-marks" (Alder); bays near Swansea, Barmouth and Bundoran (J. G. J.); Miltown-Malbay, co. Clare (Harvey); Kilkee in the same county, and Bundoran (Mrs. Hancock, *fide* Thompson); Bantry Bay (Norman); Dublin Bay (Warren and B. W. Adams); Cumbrae (Landsborough and Robertson); The Minch (J. G. J.); Loch Maddy (M'Intosh); Aberdeenshire (Macgillivray and Dawson); off Troup Head on the same coast, in 60 f. (Thomas, *fide* F. & H.); Shetland (J. G. J.). Floröen in Norway (Sars, as *P. pusilla*); Bohuslän (Malm, as *P. quadrata*); Algiers, 35 f. (M'Andrew); Ægean, 119 f. (Forbes, as *Bullæa alata*). An examination of the types has enabled me to determine the above synonyms.

B. Sculpture latticed; spire conspicuous.

6. P. PRUINO'SA*, Clark.

Bullæa pruinosa, Clark in Zool. Journ. iii. p. 339. *P. pruinosa*, F. & H. iii. p. 549, pl. cxiv. F. f. 1, 2.

BODY oblong ("convex above, flat beneath," Clark; "parum depressum," Lovén); it is white, the tentacular disk and all the margins being speckled with snowy points: *mantle* open along the back, extended behind, and indented in the middle:

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* Like hoar-frost.

margin jagged: *mouth* having a transverse orifice, and armed with a pair of horny jaws: *tentacles* united to form a large squarish-oval disk, which is notched in front: *foot* very large; sole as broad as it is long, somewhat exceeding half the length of the whole body; it is indented on each side in front; side-lobes wing-like, thick, and folding back, with jagged edges: *gizzard* none; but, instead of this organ, the stomach is furnished with two horny and finely shagreened plates, one on each side: *gills* arranged in a single coarsely pectinated plume, situate under the shell. (Lovén, and Clark's MS.)

SHELL oval, tumid, but compressed or pinched in below the apex, more solid than any of its congeners, nearly opaque, glossy in the young only: *sculpture*, numerous strong and irregular longitudinal wrinkly striæ (fringed at their edges) and finer spiral striæ, which by intercrossing give the surface a reticulated and frosty aspect, or that of lacework; the reticulation is less distinct in full-grown specimens; the very young have spiral rows of circular dots, as in *P. punctata*; edges of the mouth plain: *colour* white, with frequently a broad tawny band round the middle and a tinge of the same hue on the upper part; these markings are rather evanescent, and appear to be superficial: *spire* very small, sunk below the apex or crown, which is considerably thickened: *whorls* 2½, irregularly twisted and indistinct: *suture* deep and excavated: *mouth* oval, contracted above by the periphery and inflexion of the outer lip, curved below; it occupies about two-thirds of the under surface: *outer lip* flexuous, widely indented in the middle, and bending inwards above; edge often thick; the top slightly exceeds the crown in height; outer corner rounded: inner corner receding and acute-angled: *inner lip* broad and rather thick on the upper part, occasionally forming in the middle a tooth-like process or fold (in one specimen converted into a cluster of minute pearls), behind which is a distinct umbilical groove or depression. L. 0·25. B. 0·2.

Var. *dilatata*. Nearly smooth, more expanded and somewhat angular at the sides, and abruptly attenuated towards the crown. L. 0·075. B. 0·05.

HABITAT: Dredged off Budleigh Salterton (Clark); Plymouth (Webster); Falmouth, in trawl-refuse (Miss Vigurs, *fide* Cocks); Whitburn, dredged and from the stomachs of fish (Howse, *fide* Alder); Loch Fyne and

Hebrides (Barlee and others); Firth of Forth (Fleming, *fide* F. & H.); Moray Firth (Gordon); Aberdeenshire (Dawson); Shetland (Barlee and J. G. J.): depths 18–70 f. Bohuslän (Lovén); Norway, in 30–60 f., sandy mud (Danielssen). The variety is from Shetland.

"The animal flaps the sides of the foot upwards and downwards, as if beating the water, with considerable quickness, especially when first taken from the sea." (Clark's MS.)

The fry is devoid of sculpture; it differs from that of *P. quadrata* (which is also smooth) in being much smaller at the top, and in having the sides angulated and projecting.

C. Smooth; spire conspicuous.

7. P. NI'TIDA*, Jeffreys.

SHELL oblong, convex, very thin and fragile, nearly transparent, and of a polished lustre: *sculpture*, none on the body-whorl; but the spire has two keels or ridges, one at the outer edge of each whorl, and the other in the middle, giving this part an angulated appearance: *colour* clear-white, becoming opaque in dead specimens: *spire* flattened, placed somewhat obliquely; it is quite exposed and occupies the top of the shell: *whorls* 2½, irregularly twisted, but distinct: *suture* deep and excavated: *mouth* oval, truncated above, wide and rounded below; its area equals about two-thirds of the under surface: *outer lip* expanded, squarish at the top, and gently curved in the middle; it is level with the spire, viewed mouth downwards, and is below it, viewed mouth upwards; outer corner angular and projecting; inner corner considerably receding and acute-angled: *inner lip* forming a broad glaze on the upper part, and reflected on the pillar; there is no umbilical groove or depression. L. 0·075. B. 0·05.

HABITAT: Skye (J. G. J.); Haroldswick Bay, Unst

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* Glossy.

(Dawson). It is as yet rare. My Skye specimen has the remains of the mantle still adhering to the spire on the outside, showing that the shell is internal. Being minute, I have carefully compared all the specimens (half a dozen) with the fry of other species of *Philine*, as well as with those of *Utriculus* and *Acera*. I cannot identify this with any of them. In the last two genera the fry has the same cylindrical shape as the adult, and the first whorl or nucleus of the spire is nipple-shaped.

Phyline sinuata of Stimpson (from 6 f., sand, in Boston Harbour) appears to be allied to the present species; but the spire of the North-American shell is represented as rounded instead of carinated or angular.

D. Smooth; spire indistinct.

8. P. aperta*, Linné.

Bulla aperta, Linn. S. N. p. 1183. *P. aperta*, F. & H. iii. p. 539, pl. cxiv. E. f. 1, and (animal) pl. UU. f. 1, as *Bullæa aperta*.

Body broadly oval, rather convex above and flat underneath, slimy, and of a consistency between gelatinous and fleshy, pale yellowish-white or sometimes nearly clear white, with numerous minute snowy specks: *mantle* shield-like, with a membranous margin in front, and forming behind an angular lobe which covers the crown of the shell: *head* or anterior disk somewhat elongated, gently curved or squarish in front (now and then slightly notched in the middle of this part), and truncated behind: *tentacles*, or *eyes*, none: *foot* flexible, usually rounded in front, with a membranous margin; side-lobes thickened and folded back; these lobes, with the head-disk and pallial shield, give a quadripartite appearance to the animal: *gizzard* composed of three calcareous plates, united by a strong cartilage; they are concave on the outside, and covered over with a thin tightly stretched membrane; two of the plates, which flank the sides, have the shape of an inequilateral triangle, and are equal-sized; the third is smaller and lozenge-shaped, lying at the base between the two lateral plates; each plate has two small holes (muscular impressions?) in the middle: *odontophore*, rhachis wanting; uncini 12–15, arranged in a single row, claw-shaped, and furnished on the inner side with a jagged crest.

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* Open.

SHELL squarish oval, depressed in front, very thin and fragile, semitransparent, glossy, and iridescent: *sculpture*, plait-like and irregular lines of growth, and a few extremely slight and more irregular spiral lines, which latter are not discernible except with a lens and at certain angles of light; the texture, examined under a microscope, resembles curdled milk: *colour* whitish, with sometimes two or three clear streaks across the back: *spire* very loosely coiled, with the nucleus extremely small and concealed by a shelly deposit from the hinder lobe of the mantle; it is always more or less indented, and in the young is slightly umbilicate: *mouth* roundish-oval, of enormous size compared with that of the convoluted portion, and occupying seven-eighths of the under surface; it is obliquely truncated above, and rounded below: *outer lip* dilated, with a sinuous and very thin edge; the upper part slopes outwards, and projects considerably beyond the spire; inner corner receding and acute-angled: *inner lip* spread over the pillar, and forming at the angle where it meets the outer lip a thick and shapeless callus: *pillar* sharp and flexuous; there is no umbilical groove or depression. L. 0·85. B. 0·7.

Var. *patula*. Smaller, with the mouth larger and more expanded.

HABITAT: Sand, from low-water mark of spring tides to 50 f., on all our coasts between the Firth of Forth (Forbes) and Jersey (Dodd). It seems to attain its largest dimensions in the Bristol Channel; specimens which I found in Swansea Bay are nearly an inch and a quarter in length. The variety is from Tenby, Dublin Bay, and Connemara. I am not aware that this species has occurred in a fossil state except at Belfast, where Mr. Grainger observed it. Its existing distribution comprises the Atlantic sea-board from Upper Norway to the Canaries, the Mediterranean, Adriatic, and Ægean, at depths varying from 4 to 110 f.; specimens from the Cape of Good Hope (the original locality given by Linné), Australia, and New Zealand appear to be specifically identical with those from the north of Europe.

Its burrow or track is not unlike the run of a mole. When placed in a dish of sea-water, its gliding motion is so slow and gradual as to be perceptible only by marking the distance traversed. Mr. Daniel detected sessile Foraminifera in its gizzard; one now before me contains an *Echinocyamus pusillus.* Sometimes the plates of the gizzard, instead of being convex on the inner side, become concave by the continual process of shell-crushing. According to Lovén the fry is enclosed in a spiral shell, and swims by means of a vibratile head-veil or lobe; it is eyeless, but furnished with an operculum; the eggs are extremely numerous, and arranged in a single row, forming a very long and loosely twisted rope like a necklace; these are enveloped in oval gelatinous and transparent capsules. Another, but less precise, description of the spawn has been lately published in the 'Comptes Rendus' by Lacaze-Duthiers (who, however, does not allude to Lovén's account); and he notices some double embryos. The gizzard was first made known and figured by Colonna, who mistook it for an operculum. Müller gave full particulars of this curious instrument; but he left it to posterity to inquire its use. Strange to say, this great zoologist seems to have imagined that the shell of this species (which he calls *Bulla candida*) belonged to some other mollusk, which had served as food for his *Lobaria*! The spire is visible in Baltic specimens, and consists of between two and three whorls; this is clearly shown in the admirable illustrations which accompany the first volume of the work of Meyer and Möbius on the fauna of Kiel Bay.

Plancus says that the fishermen in his time called this shell "amygdala marina" (sea-almond); it is the *Philine quadripartita* of Ascanius, *Lobaria quadriloba* of Müller, *Bulla bulla* of Da Costa, and *Bullæa planciana* of Lamarck; the fry is *Bulla emarginata* of Adams. In Gmelin's edition of the 'Systema Naturæ' it is placed among the Testacea as *Bulla aperta*, and among the Mollusca as *Lobaria quadriloba*. Among the synonyms quoted by Martini in his 'Conchylien-Cabinet,' is the fanciful one of "*unguis humana*," derived from Colonna; the genders are thus treated somewhat in the German fashion. Pfeiffer named the South African specimens *Bullæa Capensis*, and Philippi *B. Schroeteri*. These, like the European, vary in convexity, size of the convoluted portion, and height of the outer lip. I have in vain attempted to discover a single character by which they can be distinguished.

And now, good Reader, I should be sorry if you have complained of my being too voluminous. I never professed to make this a manual; nor have I yet quite done. Let me remind you of the advice given by Seneca (De Ira, Lib. iii. c. 31. § 3), "Age potius gratias pro his quæ accepisti: reliqua expecta, et nondum plenum te esse gaude. Inter voluptates est, superesse quod speres."

The next volume will complete the work, and contain an account of the few remaining Pleurobranchiata, the Nudibranchs (by Mr. Alder), the marine Pulmonobranchs, the Pteropods, and the Cephalopods, a Supplement to the volumes already published, and other useful matter, besides plates (plain and coloured) by Mr.

Sowerby, to represent all the species and remarkable varieties of British shells. Most of these plates are engraved, and the colouring is in progress.

ERRATA.

Page 28, lines 12–13 from bottom, omit the words "*R. Balliæ* of Thompson."

,, 47, line 14 from bottom, for "L. 0·01" read "L. 0·1."

,, 55, line 6 from bottom, for "*Cuaplidæ*" read "*Capulidæ.*"

,, 68, line 5 from top, for "*Akera*" read "*Acera.*"

,, 84, line 6 from bottom, for "*Christophori*" read "*Cristofori.*"

,, 91, line 16 from top, for "Broun" read "Bronn."

,, 108, line 7 from bottom, for "1862" read "1826."

,, 167, line 13 from top, for "was (although loosely)" read "(with others) was."

,, 193, line 3 from top, for "*Mangilia*" read "*Pleurotoma.*"

,, 209, line 4 from bottom, for "Renieri" read "Renier."

,, 217, line 12 from bottom, for "south-west" read "north-west."

,, 265, after CERITHIOPSIDÆ, for "Gray" read "P. P. Carpenter."

,, 301, TRITON NODIFERUS. In strictness the specific name ought to be NODIFER.

,, 314, lines 5 and 12 from top, for "*L. brunnea*" read "*L. minima.*"

,, 356, line 15 from top, for "*Pleurotomatidæ*" read "*Pleurotomidæ.*"

,, 359, line 15 from top, for "*Manglia*" read "*Mangilia.*"

,, 360, for "PLEUROTOMATIDÆ" read "PLEUROTOMIDÆ." *Pleurotoma* is certainly feminine (from πλευρὸν and τομή), and not (as Philippi would have it) neuter. I was at first misled by his stating that those who make *Pleurotoma* a noun of the first declension, and of the feminine gender, offend against the laws of grammar (Moll. Sic. ii. p. 165, footnote). *Anatomia*, *apotome*, and *epitoma or epitome*, formed from the same verb (τέμνω), are all feminine.

,, 381, line 4 from top, omit the words "Hanley described it as *P. Metcalfei.*"

,, ,, line 8 from top, for "*P. costatum*" read "*P. costata.*"

,, ,, line 12 from top, for "*P. proximum*" read "*P. proxima.*"

,, 386, lines 7–8 from bottom, omit the words "and *Raphitoma polita* of Brusina."

,, ,, line 8 from bottom, omit the words "*P. nigra* of Potiez and Michaud."

,, 388, line 9 from bottom, for "Hanley" read "Reeve."

,, 397, line 14 from bottom, after "probably" add "and in part."

,, 399, line 13 from bottom, for "wegde-shaped" read "wedge-shaped."

TABLE of geographical and geological distribution.

(See Vol. I. pp. 314–320, Vol. II. p. 448–451, and Vol. III. pp. 377–380.)

Species.	Northern.	Southern.	Upper Tertiary.	Extra-European localities.
Gastropoda (*continued* from vol. iii. p. 380).				
Rissoa striatula	—	—		
lactea	—	—		North Africa.
cancellata	—	—	—	North Africa, Madeira, and Canaries.
calathus	—	—	—	Canaries.
reticulata	—	—		North Africa.
cimicoïdes	—	—		Greenland.
Jeffreysi	—			North America.
punctura	—	—	—	Canaries.
abyssicola	—	—		
Zetlandica	—	—	—	
costata	—	—	—	North Africa, and Canaries.
parva	—	—	—	North Africa, and Canaries.
inconspicua	—	—	—	North Africa, and Canaries.
albella	—			
membranacea	—	—	—	North Africa, and Canaries.
violacea	—	—		North Africa.
costulata	—	—		North Africa.
striata	—	—	—	Greenland, Northern Asia, and Canaries.
proxima		—	—	Canaries.
vitrea	—	—	—	
pulcherrima		—		
fulgida		—		
soluta	—	—		
semistriata	—	—		North Africa.
cingillus	—	—	?—	
Hydrobia ulvæ	—	—	—	North Africa.
Barleeia rubra	—	—		Canaries.
Jeffreysia diaphana	—	—		
opalina		—		
globularis				
Skenea planorbis	—	—	—	Madeira, Greenland, and Massachusetts.
Homalogyra atomus	—	—	—	North Africa.
rota	—	—		North Africa.
Cæcum trachea	—	—	—	North Africa, and Canaries.
glabrum	—	—	?—	Canaries.

Species.	Northern.	Southern.	Upper Tertiary.	Extra-European localities.
Gastropoda (*continued*).				
Turritella terebra	—	—	—	North Africa.
Truncatella truncatula	—	—		North Africa, and Canaries.
Scalaria Turtonæ	—	—	—	North Africa, and Madeira.
communis	—	—	—	North Africa, and Canaries.
Trevelyana	—	—	—	
clathratula	—	—	—	North Africa.
Aclis unica	—	—		
ascaris	—		—	
supranitida	—	—	—	North Africa, and Madeira.
Walleri	—			
Gulsonæ		—	—	
Odostomia minima				
nivosa				
truncatula				
clavula	—			
Lukisi				
albella	—	—		
rissoïdes	—	—		North Africa.
pallida	—	—	—	
conoïdea	—	—		North Africa, and Canaries; ? Red Sea.
umbilicaris	—			
acuta	—	—	—	Canaries.
conspicua	—	—		
unidentata	—	? —	—	? North Africa.
turrita	—	—		Canaries.
plicata	—	—		North Africa.
insculpta	—		—	
diaphana				
obliqua	—	—		
dolioliformis	—	—		
decussata	—		—	
clathrata		—		Canaries.
indistincta	—	—	—	Canaries.
interstincta	—	—	—	Canaries.
spiralis	—	—	—	
eximia	—			
fenestrata	—	—		North Africa.
excavata	—	—		North Africa.
scalaris	—	—	—	North Africa, and United States.
rufa	—	—		North Africa, Madeira, and Canaries.
lactea	—	—	—	North Africa, Madeira, and Canaries.
pusilla	—	—		North Africa.

Species.	Northern.	Southern.	Upper Tertiary.	Extra-European localities.
Gastropoda (*continued*).				
Odostomia Scillæ	—	—		Madeira and Canaries.
acicula	—	—	—	North Africa.
nitidissima	—	—		
Ianthina rotundata	—	—		Madeira and Canaries; ? Azores.
Stilifer Turtoni	—	—		Canaries.
Eulima polita	—	—	—	North Africa.
intermedia	—	—	—	North Africa, Madeira, and Canaries.
distorta	—	—		North Africa, Madeira, and Canaries; ? Mazatlan.
stenostoma	—			
subulata	—	—		North Africa, and Madeira.
bilineata	—	—		
Natica Islandica	—		—	Northern Asia and North America.
Grœnlandica	—		—	Northern Asia and North America (east and west).
sordida		—	—	North America.
catena	—	—	—	
Alderi	—	—	—	North Africa.
Montacuti	—		—	
Adeorbis subcarinatus	—	—	—	North Africa.
Lamellaria perspicua	—	—	—	North Africa, Madeira, Azores, and North America.
Velutina plicatilis	—			Greenland and Northern Asia.
lævigata	—		—	Northern Asia and North America (east and west).
Torellia vestita	—			
Trichotropis borealis	—		—	North America and Northern Asia.
Aporrhaïs pes-pelecani	—	—	—	North Africa.
Macandreæ	—			
Cerithium metula	—	?—		United States.
reticulatum	—	—	—	North Africa, Madeira, and Canaries.
perversum	—	—	—	North Africa, Madeira, Canaries, and North-west America.
Cerithiopsis tubercularis	—	—	—	North Africa, Madeira, Canaries, Azores, and United States.
Barleei				
pulchella		—		
Metaxa		—	—	North Africa, Madeira, and Canaries.

Species.	Northern.	Southern.	Upper Tertiary.	Extra-European localities.
Gastropoda (*continued*).				
Cerithiopsis costulata	—		—	Greenland.
Purpura lapillus	—	—	—	North Africa, Azores, Northern Asia, North America (east and west), and Mexico.
Buccinum undatum	—		—	North America.
Humphreysianum	—		?—	
Buccinopsis Dalei	—		—	? Sea of Okhotsk and Behring's Straits.
Triton nodifer	—	—		North Africa, and Azores.
cutaceus	—	—		North Africa, and Canaries.
Murex erinaceus	—	—	—	North Africa, Madeira, and Azores.
aciculatus	—	—	—	North Africa, Madeira, and Canaries.
Lachesis minima	—	—	?—	North Africa, and Madeira.
Trophon muricatus	—	—	—	? Massachusetts.
Barvicensis	—		—	
truncatus	—		—	North America.
Fusus antiquus	—	—	—	
Norvegicus	—		—	Greenland and Sea of Okhotsk.
Turtoni	—			
Islandicus	—			Greenland.
gracilis	—		—	Northern Asia.
propinquus	—		—	
buccinatus	—	—		
Berniciensis	—			
fenestratus	—			
Nassa reticulata	—	—	—	North Africa.
nitida		—		North Africa.
incrassata	—	—	—	North Africa, Madeira, and Azores.
pygmæa	—	—	—	North Africa.
Columbella haliæeti	—			
nana	—			
Defrancia teres	—	—		North Africa, Madeira, and Canaries.
gracilis	—	—		North Africa, Madeira, and Canaries.
Leufroyi	—	—	—	North Africa, Madeira, and Canaries.
linearis	—	—	—	North Africa, Madeira, and Canaries.
reticulata	—	—	—	North Africa.
purpurea	—	—	—	North Africa, Madeira, and Canaries.
Pleurotoma striolata	—	—		Madeira and Canaries.

Species.	Northern.	Southern.	Upper Tertiary.	Extra-European localities.
Gastropoda (*continued*).				
Pleurotoma attenuata	—	—		North Africa, and Canaries.
costata	—	—	—	
rugulosa		—		North Africa.
brachystoma	—	—		North Africa.
nebula	—	—	—	North Africa, and Madeira.
lævigata	—	—		North Africa, and Azores.
nivalis	—			
septangularis	—	—	?—	North Africa, Madeira, and Canaries.
rufa	—		—	
turricula	—		—	Greenland and United States.
Trevelyana	—		—	North America (east and west).
Marginella lævis	—	—	—	North Africa.
Cypræa Europæa	—	—	—	North Africa.
Ovula patula		—		
Cylichna acuminata	—	—	—	North Africa.
nitidula	—			
umbilicata	—	—	—	North Africa.
cylindracea	—	—	—	North Africa, Madeira, and Canaries.
alba	—		—	North America (east and west).
Utriculus mammillatus	—	—	—	North Africa, and Canaries.
truncatulus	—	—	—	North Africa, and Canaries.
obtusus	—		—	North-east America; ? Greenland.
ventrosus				
expansus	—			
hyalinus	—		—	Madeira, Canaries, and North America.
Acera bullata	—	—	—	
Actæon tornatilis	—	—	—	North Africa.
Bulla hydatis	—	—		North Africa, and Canaries.
utriculus	—	—		North Africa, and Canaries.
Scaphander lignarius	—	—	—	North Africa.
Philine scabra	—	—	—	
catena	—	—	—	
angulata				
quadrata	—		—	Greenland and Massachusetts.
punctata	—	—		North Africa.
pruinosa	—			
nitida				
aperta	—	—	—	North Africa, Madeira, Canaries, Cape of Good Hope, Australia, and New Zealand.
Total 182	160	126	93	

This Table (excluding doubtful cases) shows, with regard to the British seas, 114 northern and southern, 46 peculiarly northern, and 12 peculiarly southern species; 10 other species have not yet been noticed on any foreign coast. The following species occur in our newer tertiaries, viz.:—*Turritella polaris*, *T. reticulata*, *Scalaria Grœnlandica*, *Acirsa borealis*, *Natica affinis*, *N. Smithii*, *Velutina undata*, *V. lanigera*, *Trichotropis insignis*, *Admete viridula*, *Cerithium tuberculatum*, *Buccinum Grœnlandicum*, *B. plicosum*, *Trophon clathratus*, *T. craticulatus*, *Fusus despectus*, *F. latericeus*, *Columbella Holböllii*, *Pleurotoma pyramidalis*, *Cylichna striata*, and *Philine lima*; all these, except *Cerithium tuberculatum*, inhabit the arctic seas. Of the species given in the present Table as fossil, 24 are peculiarly northern, and 4 peculiarly southern; the rest are common to both divisions.

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The synonyms, as well as the names of spurious species, and of species, genera, and other groups which are not described in this volume, are in italics.—The figures in smaller type refer to the page in which the description of species, genera, and higher groups will be found.

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EXPLANATION OF PLATES.

Frontispiece.

Ianthina and float.

Plate I.

Fig. 1. *Rissoa parva.*
2. *Barleeia rubra.*
3. *Jeffreysia diaphana.*
Fig. 4. *Skenea planorbis.*
5. *Homalogyra atomus.*
6. *Cæcum trachea.*

Plate II.

Fig. 1. *Turritella terebra.*
2. *Truncatella truncatula.*
3. *Scalaria communis.*
Fig. 4. *Aclis supranitida.*
5. *Odostomia spiralis.*

Plate III.

Fig. 1. *Ianthina rotundata.*
2. *Stilifer Turtoni.*
3. *Eulima polita.*
4. *Natica catena.*
Fig. 5. *Adeorbis subcarinatus.*
6. *Lamellaria perspicua.*
7. *Velutina lævigata.*

Plate IV.

Fig. 1. *Torellia vestita.*
2. *Trichotropis borealis.*
3. *Aporrhaïs pes-pelecani.*
Fig. 4. *Cerithium reticulatum.*
5. *Cerithiopsis tubercularis.*

Plate V.

Fig. 1. *Purpura lapillus.*
2. *Buccinum undatum.*
3. *Buccinopsis Dalei.*
Fig. 4. *Triton cutaceus.*
5. *Murex erinaceus.*

Plate VI.

Fig. 1. *Lachesis minima.*
2. *Trophon muricatus.*
3. *Fusus antiquus.*
Fig. 4. *Nassa reticulata.*
5. *Columbella haliæeti.*

Plate VII.

Fig. 1. *Defrancia linearis.*
2. *Pleurotoma turricula.*
3. *Marginella lævis.*
Fig. 4. *Cypræa Europæa.*
5. *Ovula patula.*

Plate VIII.

Fig. 1. *Cylichna cylindracea.*
1ᵃ. Odontophore of *C. alba.*
2. *Utriculus obtusus.*
3. *Acera bullata.*
Fig. 4. *Actæon tornatilis.*
5. *Bulla hydatis.*
6. *Scaphander lignarius.*
7. *Philine aperta.*

END OF VOL. IV.

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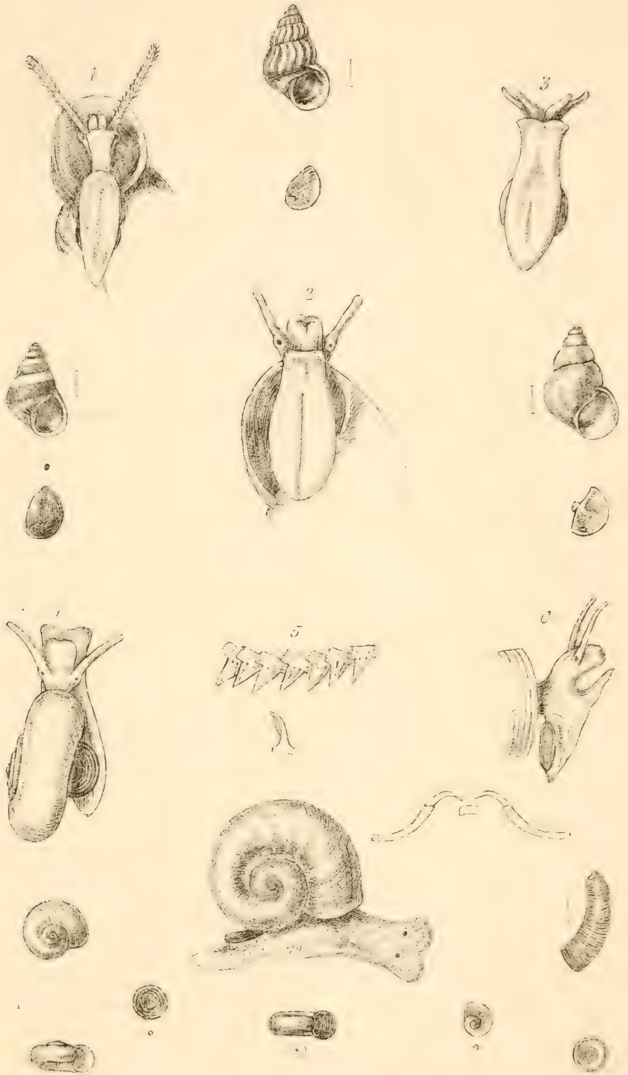
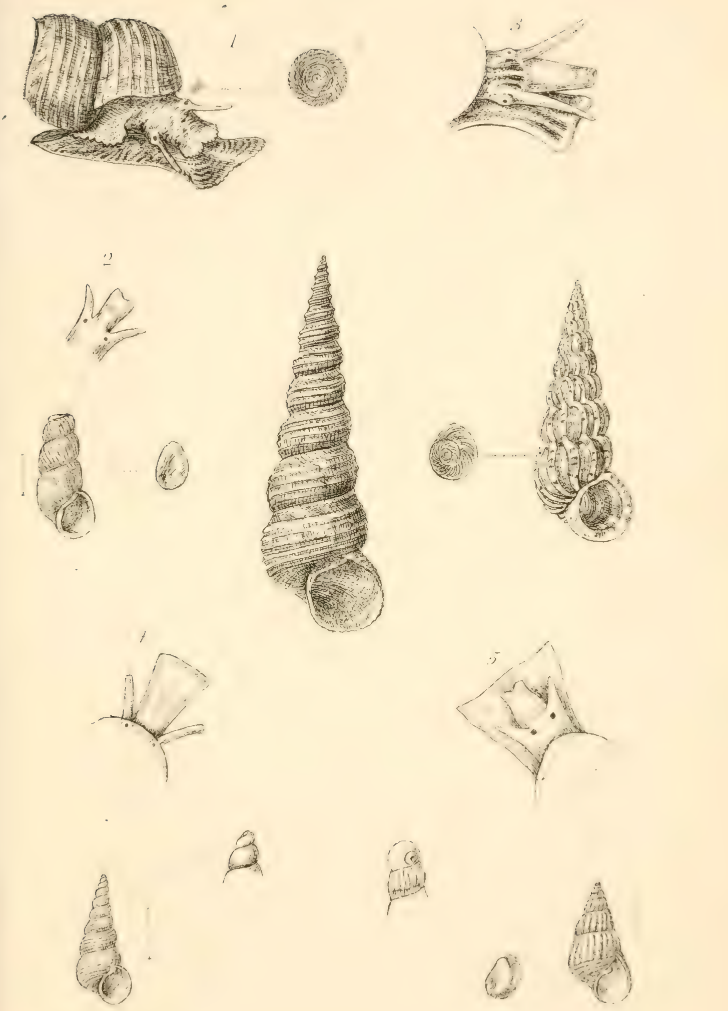


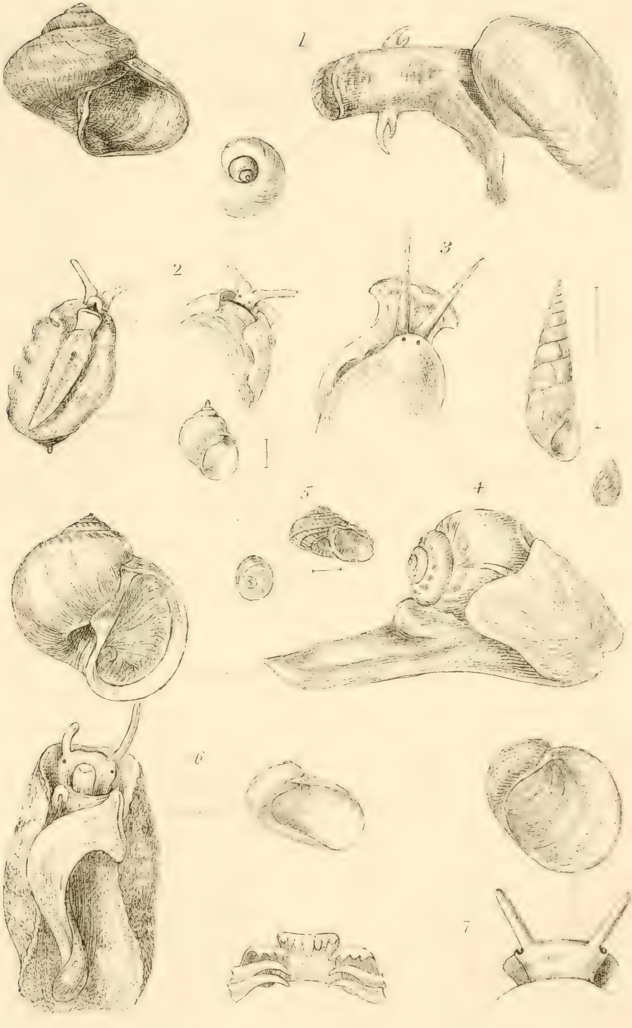
1. *Rissoa parva*. 2. *Barleeia rubra*. 3. *Jeffreysia diaphana*
4. *Skenea planorbis*. 5. *Homalogyra atomus*. 6. *Cæcum trachea*

Plate II.

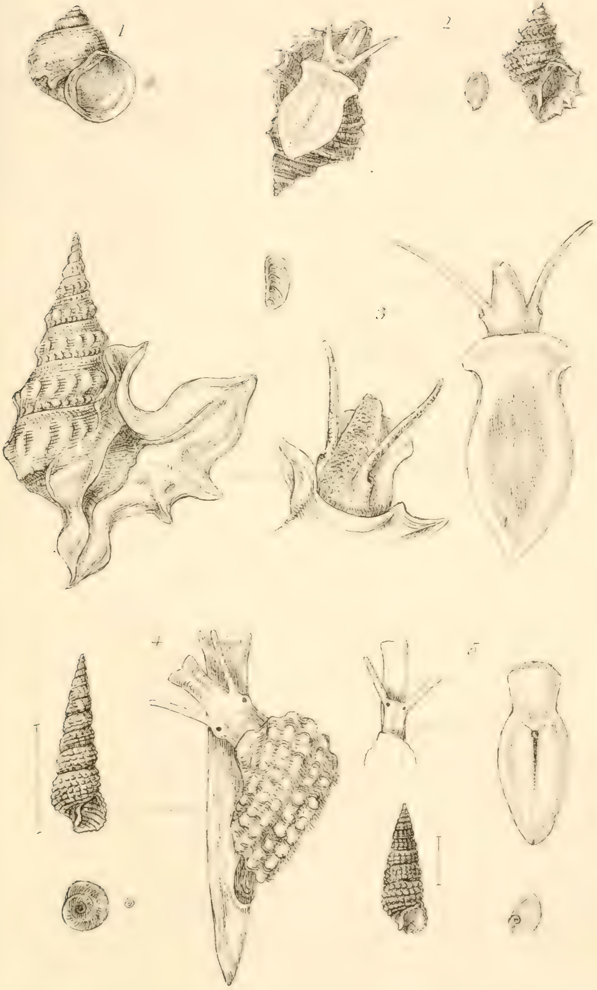


urritella terebra. 2.Truncatella truncatula. 3.Scalaria communis
Aclis supranitida. 5.Odostomia spiralis.

Plate III.

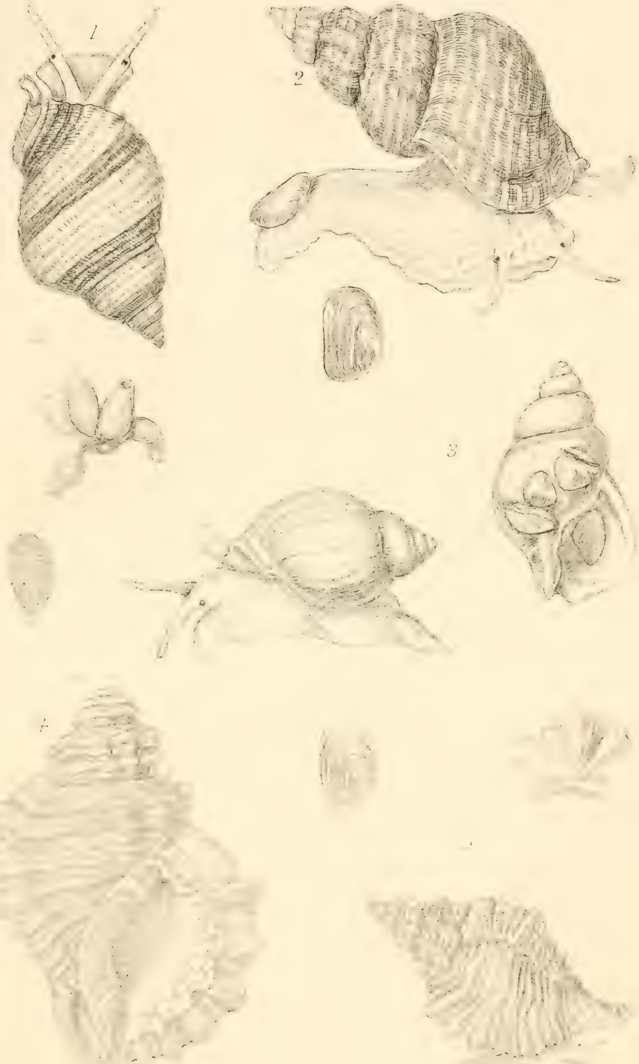


1. *Ianthina rotundata*. 2. *Stilifer Turtoni*. 3. *Eulima polita*.
4. *Natica catena*. 5. *Adeorbis subcarinatus*. 6. *Lamellaria perspicua*.
7. *Velutina lævigata*.



Torellia vestita. 2. *Trichotropis borealis.* 3. *Aporrhaïs pes-pelecani*
Cerithium reticulatum. 5. *Cerithiopsis tubercularis.*

Plate V. Vol. IV.



1. Purpura lapillus. 2. Buccinum undatum. 3. [illegible]
4. Triton cutaceus. 5. Murex erinaceus.

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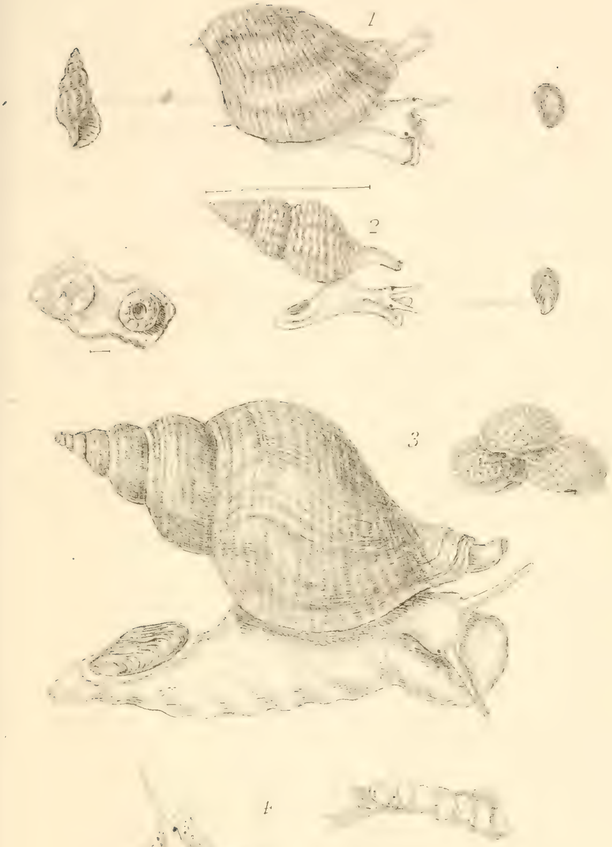
Plate VI.



1. Lachesis minima. 2. Trophon muricatus. 3. Fusus antiquus. 4. Nassa reticulata. 5. Columbella haliæeti.

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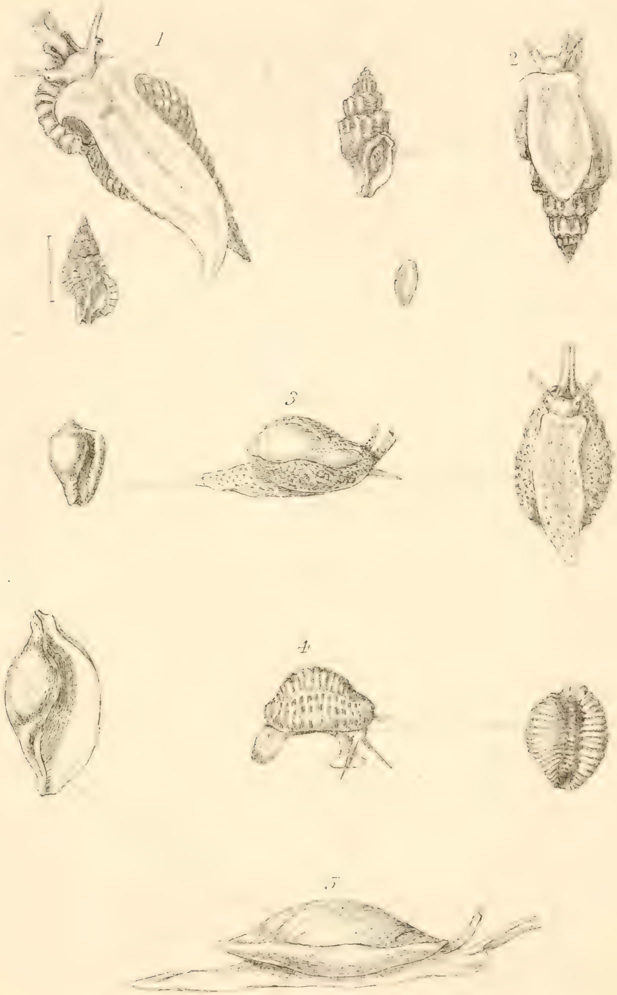

1. Defrancia linearis. 2. Pleurotoma turricula. 3. Marginella lævis.
4. Cypræa Europæa. 5. Ovula patula.

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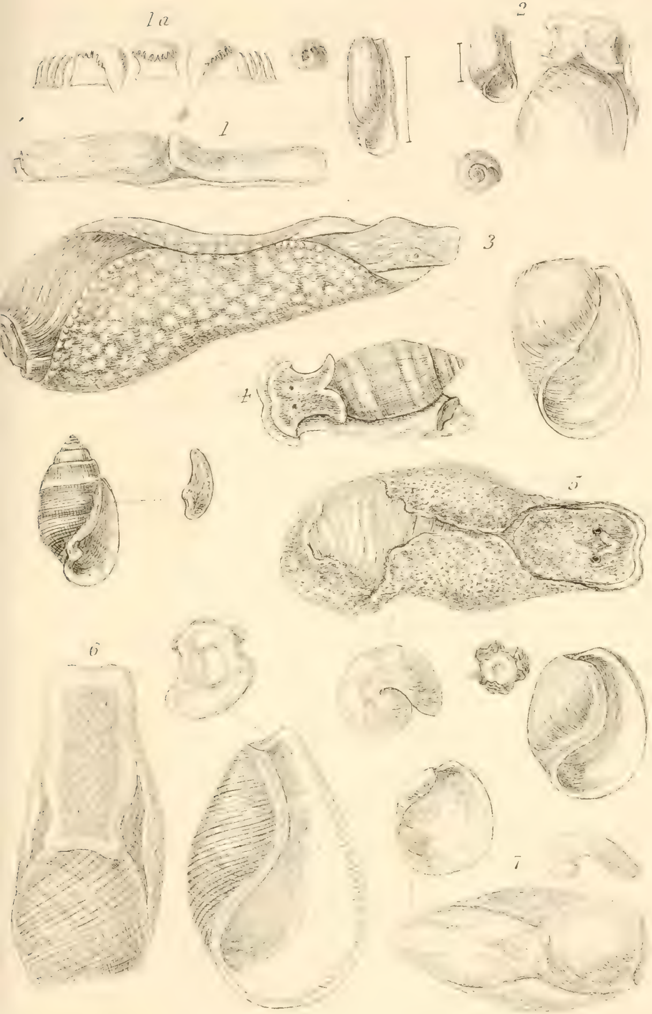
Plate VIII.



1. Cylichna cylindracea. 1a Odontophore of C. alba. 2. Utriculus obtusus. 3. Acera bullata. 4. Actæon tornatilis. 5. Bulla hydatis. 6. Scaphander lignarius 7. Philine aperta.

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